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Clear Creek and Gilpin County Notes

By Stephen L. Goodale*

SYNOPSIS—Some placer mining still conducted. District quiet but technically interesting. Large breast water-wheels, vertical belts for stamps, short runs in custom mills, large belt slime-concentrator, geared drive for cam shafts, etc., exemplify departures from current practice. Lack of coöperation among owners of small properties retards development. Many mills foolishly erected and abandoned. One example of a successful small-scale mill. Urgent need of better treatment processes. Sigafoos tunneling machine is being developed.

A granite monument stands in Chicago Gulch near Idaho Springs to mark the place where gold was first found in Colorado in 1858. Placer mining is no longer carried on in Chicago Gulch, but a few workers are still at it in other gulches in this region, and in spite of the fact that most of the gravel has been washed over at least several times, they are usually able to recover enough to pay wages, although there is no longer any hope of striking a bonanza.

Fig. 1. Quartz Hill, Central City

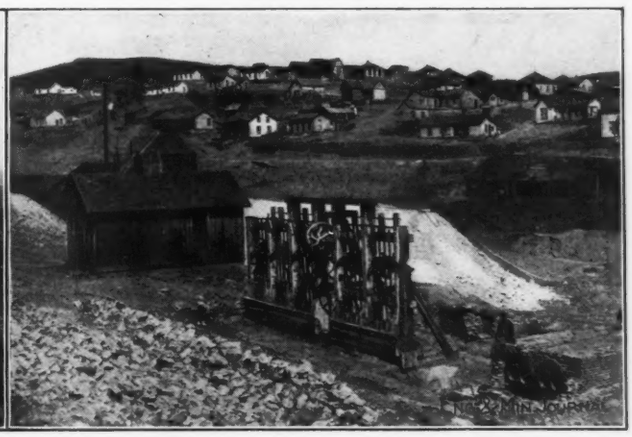

Fig. 2. Abandoned Plants at Nevadaville

Trommel and Carpet Gold Washer

Fig. 3 shows a typical outfit in Nevada Gulch. The washer is made of a piece of old trommel screen set over the upper end of a line of sluice boxes, the latter being lined with old carpet. The gravel is worked around on the screen so that the fine dirt is carried through and over the carpet by a small stream of water. This carpet is occasionally washed off into a tub, and the concentrates thus obtained are carefully cleaned by hand panning and the gold separated. It is surprising that, although the dirt has already been washed several times, some coarse gold is still recovered; most of it, however, is extremely fine. It is considered a good day's work to recover $3 in gold, and concentrates worth perhaps $1.50 more.

Districts Quiet but Technically Interesting

These districts appear remarkably quiet; there is none of the excitement of a new camp, and not much money is coming in for investment in new undertakings. There is, however, a good, steady production from a number of mines, and some legitimate prospecting going on. There is much of interest here to the student of mining, not only in the milling operations of such companies as the Argo, and in the Malm dry-chlorination process, but also in the regular mining operations and even in the old mills. It is intended in this article merely to describe briefly a few of the things of general interest peculiar to the region.

Water Power Installations Varied and Interesting

The utilization of water power is illustrated in several stages, ranging from the old breast wheel with its power directly applied through gearing, to the modern Pelton or to the high-efficiency turbine driving a dynamo for long-distance power transmission. The Hidden Treasure mill was driven in part by the largest breast wheel ever put in commission. This mill is now being dismantled, having had several years of idleness following a noisily suc-

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cessful career, and the water-power drive is now practically its only feature of engineering interest. The mill was a good example of typical Gilpin County stamp-mill practice with slow speed, high drop, hand-fed stamps, amalgamation on short plates, concentration by bumpers, large losses and low recovery.

Large Breast Wheel of Unique Design

The waterwheel is 50 ft. 6 in. in diameter, the contractor having been allowed to add, at his own expense, 6 in. to the specified size of 50 ft., after the contract had been let, in order to have the credit of building the largest wheel in existence, a record not likely to be broken. The buckets are of about 2.36 cu. ft. capacity each, being nearly 21 in. deep, about 3¼ in. wide and 5 ft. long across the face of the wheel. There are 20 built-up spokes, each consisting of two 6x10-in. timbers at the outside of the wheel with two ¾-in. tie-rods across their ends for stiffening. The inner end of each stick is held rigidly in the 6-ft. diameter center plates by three 1-in. bolts, and the outer ends are mortised to the rim of the wheel. Power was transmitted from the wheel through either one of two toothed bands encircling the rim, one on each side of the buckets. This gear is of 4-in. pitch, and the teeth are 6 in. wide by 2⅜ in. high, the plates being bolted to the rim; lugs mortised into the wood at 16-in. centers serve to take the thrust. The wheel rests on a 6-in. shaft, reinforced by having several rails bound on between the hub plates. This shaft has merely to carry the weight of the structure and not transmit any turning moment, inasmuch as the power is taken off where it is applied, at the rim of the wheel. While the housing is now in bad condition, the wheel itself looks as if it could be started up at short notice.

Short Runs and Frequent Clean-ups in Custom Mills

The old local custom of running each lot of ore separately for the account of the mine operator, is still followed at the operating mills; the milling companies do not usually purchase the ore, but simply turn over to the mine owner or lessee the gold and concentrate actually recovered, and receive payment for its treatment according to a more or less regular schedule. This practice involves frequent careful cleaning of the plates and concentrate boxes, and the retorting of small lots of amalgam at a time, as most of the mines shipping to these mills operate on a rather small scale. As to the concentrate, the samplers are willing to purchase small individual lots, which are kept separate at the mill until settled for and are then bulked for shipment to the smelters.

The Polar Star mill, a short distance down Clear Creek below the Hidden Treasure, is running intermittently on custom ore, a 25-stamp section of the mill being driven by a waterwheel similar to the one described but smaller. On this wheel, however, the gear is about half way between the rim and hub instead of at the rim. A geared drive for stamps seems to have been quite usual hereabouts, and is shown in Fig. 2, an old mill at Nevadaville.

The superintendent of the Polar Star, at the time of my visit was retorting a lot of amalgam which he estimated to contain 17 to 20 oz. of bullion worth about $18 per oz. This he was doing in an ordinary heating stove, which for small lots he considered easier than his regular retorting furnace. The outlet pipe for condensing mercury from his small retort was cooled only by water poured over it by hand at frequent intervals, the water being held against the pipe to a certain extent by a rough tin trough underneath.

An 80-Stamp Mill with Vertical-Belt Drive

At the 80-stamp mill of the 50 G. M. Co. is an unusual arrangement of belt drive. The mill engine is on the lower or concentrator-floor level at one end of the mill as usual, but the line shaft is placed exactly over the batteries, being hung from the roof trusses. The stamps are driven by a series of vertical belts from pulleys on this line shaft. This arrangement gives rather more free space than usual about the lower part of the batteries, but it is questionable if this advantage is sufficient to outweigh the expense of long belts, the disadvantage of vertical belts, etc. The pulley centers on the main drive must be 35 to 40 ft. apart.

Fig. 3. Placer Mining in Nevada Gulch

Many owners of small properties about Central City seem to be waiting for this company to pump out its mine and drain their workings, since it is one of the deepest mines in the district and drains many others when operating. There seems to have been no coöperation on the part of the smaller operators in bearing the expense of this pumping. A large body of ore is said to exist on the 1400 level of this mine, but it would cost about $60,000 to pump out and more than that to cover indebtedness on the mine before operations could be begun. This combination of circumstances has kept the property idle a long time, so that the workings and timbering are probably in poor condition.

Dog-in-the-Manger Policy

Almost all mining camps, both new and old, present similar instances of people hanging on in the hope that some one else will turn in and work. What a deadening sort of life it is! The people concerned are not always at fault or possessed with laziness—although they are

pretty sure to acquire the latter quality—but are frequently the victims of chance. Many of the Colorado camps reported as dead are apparently so because of these people who hang around waiting for the other fellow to get busy and start something, being neither willing themselves to work nor to accept for their property a reasonable sum from some one who could work it. It is hard to tell on what such people live, for they toil not, nor is their spinning of more substantial stuff than dreams.

A Profitable Small-Scale Mill

A pleasing contrast to the conditions outlined is found in the little W. S. Smith & Son mill, a good illustration of a small business run on a conservative basis, without much advertising or display, but making a commercial success nevertheless, possibly because the owner is the manager and is managing energetically. It would seem as if there were opportunity for a large number of similar small operations in many places in Colorado for people with limited capital but with a large stock of energy. This mill is housed in a plain, low, sheet-iron-covered building, on the road between Central City and Blackhawk. The equipment consists of a Denver crusher and a Denver No. 2 quartz mill, driven by a 25-hp. slide-valve engine. An amalgamating plate of fair length is used and the tailings run over a Wilfley table. Mr. Smith speaks highly of his equipment, saying that he can secure excellent amalgamation from the pulp produced by this mill, partly because there is little sliming and the pulp comes out as a product of nearly uniform size, and also partly because he watches everything carefully, believing that it is not much use to handle material unless one saves the valuable contents therein. This little mill is run on surface stuff, old dumps, etc., and, as a business, reminds one somewhat of the gulch mining, to which it is big brother; although on a larger scale and requiring more capital, it is not more than many a man could easily handle.

Better Treatment Processes Necessary

The mine owners in this region, as in others, have to contend with too low a price for their product, receiving usually far less than that which should be obtainable considering the valuable metals contained. In this respect, the miners are in about the same fix as the farmers who think that they are robbed by the railroads and commission men; for not only are the miners also largely at the mercy of the railroad, but much of what the railroad leaves is taken by the reduction company working their ores.

This district is much in need of a system of metallurgical treatment that will recover nearly all of the desirable metal of the ores, and will do it at a reasonable cost. The ores of the region present difficult treatment problems, because of their great variety in general, and because the character of an ore frequently changes in the veins within a short distance. A proper treatment should recover both clean and rusty gold, heavy, hard, tough sulphides, and also brittle, valuable minerals that slime and float; it should recover and get paid for not only lead and copper, but zinc also when present.

This may explain, partly at least, why so many companies in this district have erected mills, but it can scarcely explain why so many of these mills should have been dedicated to the memory of the two follies: building a mill without ore and building a mill according to personal prejudices. Within a short distance of Idaho Springs there are at least 17 mills, of which half perhaps may be operated intermittently, while probably not more than three or four are in anything like continuous operation. Still another is being built. These mills in their equipment vary greatly from straight concentrators, like the Jackson, to a modern cyanide plant, like the Argo. Almost every one of these mills has some feature of peculiar interest; in the Jackson, for instance, there is a great belt slime-concentrating table, the belt being about 5 ft. wide and 15 ft. long on top, and working on the principle of the buddle; it was designed and erected there, and while probably the only one of its kind in existence, does excellent work. The older mills are recovering probably not over 75% of the ore content, some of them less, while the newest mill is able to get in the neighborhood of 90%.

Work on Metallurgical Problems Is in Progress

It is a pleasure to see that this problem of ore treatment is being undertaken by men who have the technical training and practical experience necessary to secure results. The Malm dry-chlorination plant in process of building seems to be halted temporarily, with the mill erected and the machinery partly installed. This process promises much for not only this district but for others as well, if the company is able to maintain operations through the trying-out stage. Other work also is in progress, notably cyanidation, which was tried out at the Hudson, and is being continued at the Argo mill. Many mill men are at work improving amalgamation and putting concentration processes on a more satisfactory basis.

The Sigafoos Tunneling Machine

On the mining side the Sigafoos tunneling machine may be mentioned. This is being tried out at Georgetown with an 8-in. machine. Experiments are being made with different forms of stamp head, and with other adjustments varied to get the machine on a commercial basis. The machine can be made to bore a hole with its present equipment, and is so doing, but probably not yet in a commercial way.

The Kennedy District, Nevada

The Kennedy mining district, about 55 miles south of Winnemucca, Nev., after experiencing two periods of relative prosperity with corresponding depressions, is now practically owned by the Gold Note Mining & Milling Co., which controls about 75% of the mineralized territory, according to Paul Klopstock ("Bull. A. I. M. E.," July, 1913). The district is about 6½ miles long, north and south, and 1½ miles wide, comprised chiefly of eruptive rock and gneiss. Quartz porphyries, grano-diorite, diabase and rhyolite with the gneiss make up the bulk of the country. Near the town of Kennedy several rhyolitic dikes have been intruded, ranging from 6 to 20 ft. in thickness and often mineralized to form ore. Near the Gold Note mine, quartz porphyries and grano-diorite have been intruded by rhyolite, and along the planes of intrusion a number of veins have been formed. The veins can be traced for from ½ to 1½ miles on their northwest strike; they range in dip from 30° to 65° to

the south, and in width from 1½ to 5 ft. They were formed after the rhyolithic intrusions or at the same time, and pass indiscriminately through the various country rocks; they show slickensided walls and clay selvages. Apparently, the rhyolite in its upward movement met resistance and spread out, causing fractures which probably unite at a depth of 850 ft. below the surface. The gangue is silica, rhyolite and calcite. Faulting occurs, but is not serious. The oxidized zone varies from 50 to 125 ft. in depth on the dip and is underlain by a zone of secondary sulphide, varying from 50 to 75 ft. in depth, below which the primary sulphides are found. Iron sulphide only is present in quantity, lead, zinc and copper being uncommon. Apparently, there is a close connection between the fault planes and the mineral content of the secondary sulphide zone.

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Metal Tariff in the Senate

WASHINGTON CORRESPONDENCE

The Senate Finance Committee on Friday, July 18, filed with the Senate through Chairman Simmons, a report dealing with the principal features of the tariff bill as altered by the Finance Committee. This report devotes considerable attention to the changes in the metal schedule made by the Committee. In part the Committee says:

The principal alterations made consist of placing pig iron, iron kentledge, spiegeleisen, iron and steel scrap, ferromanganese, iron in blooms, loops and slabs, steel ingots, blanks, and billets, cast-iron pipes, and antimony ore on the free list, and in materially reducing the rates upon many of the heavy products of iron and steel as a result of transferring the foregoing basic materials to the free list.

All of the enumerated products thus transferred to the free list, with the exception of ferromanganese, are produced in large quantities here at a cost which does not exceed that in other countries. They are all articles of prime importance in the industries generally, and, owing to their heavy and bulky nature, the relatively high cost of transportation in itself constitutes an impediment to excessive importations. In addition to this, the industry is largely controlled by a few great corporations.

Judged by all available tests, the American iron and steel industry is fully able to sustain itself without Government aid. It has unrivaled supplies of raw material well situated with reference to one another. It has the use of abundant capital and the best of business organization, as shown by the large profits earned and the large reinvestments made in the industry. It is able to export in competition with foreign countries, as is freely admitted by its chief officials and as is shown by the figures of the Government. Were the domestic demand not so extensive as it has been, exports might be increased, and the testimony of the officers of the United States Steel Corporation shows that the prices abroad are about as satisfactory as they are at home. The industry has all the advantage of low costs when estimated from a rigid accounting standpoint. For all these reasons it may be regarded as well fitted from every point of view in which to establish rates of duty upon a strictly revenue-producing basis.

The House bill places iron ore upon the free list mainly because it was found that the domestic supply of iron ore was largely controlled by the United States Steel Corporation and for the purpose of aiding the independent iron and steel manufacturers in their competition with this monopoly.

For similar reasons the Committee on Finance thought that ferromanganese should also be placed upon the free list. The United States Steel Corporation largely controls the domestic ore out of which ferromanganese, which is a necessary material in the manufacture of steel, is produced. This corporation is the only producer of ferromanganese in this country, but produces it only for its own use and consumption. It was thought under these conditions just that the independent competitors of this monopoly should be permitted to import this high-priced alloy free of duty, and that with iron ore and ferromanganese on the free list domestic competition would be strengthened and the price of the finished products of iron and steel would be eventually lowered.

The changes otherwise recommended by the Finance Committee in Schedule C are practically all in the direction of reductions from the House rate. Having placed pig iron and allied products upon the free list, your committee felt justified in reducing the House rates upon many of the products of these raw and semi-raw materials, such as beams, girders, joints, car trucks, anchors, tinplate, etc. For this reason, as well as because the House rates were thought not sufficiently low to be competitive, further reductions were made in some of the more highly organized products of this industry.

The committee amendment as to automobiles provides for reclassification of that paragraph and reduces the rates on low-priced automobiles 33% and 56%, respectively, from the House rate, according to the value of the automobile. The duty is likewise reduced on motor cycles, rail wheels and tires, and a number of other products used heavily in the industries.

The duty on aluminum is changed from an ad valorem to a specific and the House rate reduced about 1c. per lb. It was thought by your committee that the circumstances justified a further reduction than that made by the House, and that owing to the great variation in the price of this product and the close alliance between the domestic and the foreign manufacturers, justified the substitution of a specific for an ad valorem rate.

Of the few cases where the Senate committee has raised the rates on the items carried in the steel schedule, those of lead ores, zinc ores, and zinc may be mentioned. In the House bill the rate upon lead ore is fixed at 0.5c. per pound, which is a reduction of 66⅔% from the rate of the Payne-Aldrich bill.

The reductions made in the House bill on lead ore, zinc ore, and zinc appealed to the Finance Committee as too radical and below the point of competition. In the interest of the industry, a continuation of which is absolutely essential for the welfare of the mining interests, the Senate committee raised the duty to 0.75c. per pound on lead ores, which was also the rate of the Wilson law.

Zinc in ores were first made dutiable under the present law, the rate being 0.25c. per lb. on ores carrying zinc in excess of 10% and less than 20%, 0.50c. per lb. in excess of 20% and less than 25%, and 1c. per lb. on all ores in excess of 25%. Duties paid on importations of zinc-bearing ores for 1910 show an equivalent ad valorem rate of 55.64 per cent. and for 1912 of 44.64 per cent.

The House fixed a compound duty of 10% ad valorem upon zinc ore and zinc in bars. The rates appear to be somewhat lower than those upon lead ore or lead in bars. The metals are frequently found in association with each other and are extracted by similar processes. The committee has therefore reported the duty on zinc in ores at 12½% ad valorem and upon zinc in bars at 15% ad valorem, which, though lower than the rate on lead, compares more favorably with it and will increase the revenue derived from importations.

Antimony ores, which were placed on the free list by the Committee on Finance, are produced in this country only to a very limited extent. A duty on this article is exclusively for revenue purposes, but considering the extended consumption of antimony for manufacturing purposes in many lines of industrial activities the revenue from imports of antimony ore are dispensed with.

The rate for the so called basket paragraph of this schedule, imports under which are very heavy, is under the present law 45% ad valorem; in the House bill it is reduced to 25%, and in the bill as amended by the Senate committee a further reduction to 20% is made, or below one-half of the present rate.

To sum up, the changes made by the Committee on Finance in Schedule C may be classified under two general heads—those relating to iron and steel and those relating to other metals.

(a) In general, the committee was of the opinion that the rates fixed by the House on iron and steel were too high. The evidence produced in recent investigations of the steel industry has conclusively shown that that branch of manufacture is making large returns and is amply able to hold its own in the world market, as well as against foreigners in domestic trade. Iron and steel products are essentially necessaries, and a reduction of rates on them to the lowest possible point is in line with the principles laid down by the party in past years. Not only, therefore, has the committee thought best to carry the heavier products to the free list, but it has made a general cut upon all of the more immediate derivatives of these products.

(b) On the other metals, lead, zinc, etc., it has been thought that the rates established by the House were too low, and consequently moderate advances are made.

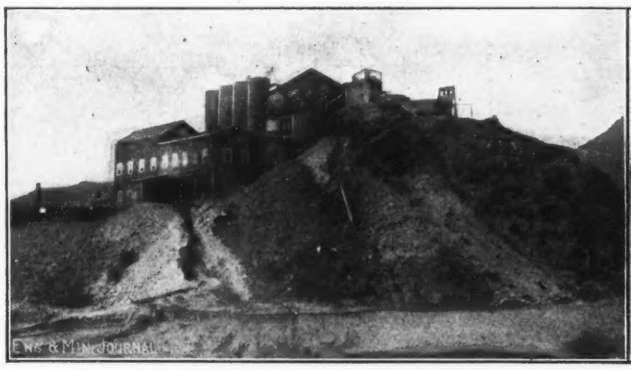
Two Arizona Cyanide Mills

By Herbert A. Megraw

SYNOPSIS—Discussion of the Tom Reed mill, at Oatman and the Vulture mill at Wickenburg, Ariz., which are situated so that living and working conditions are difficult. Both are all-slime mills. The Tom Reed treats continuously through Pachuca tanks while at the Vulture there are no agitation tanks at all. The most important feature is the absence of a filtration plant at the Vulture and the probable scrapping of the one at the Tom Reed mill.

The property of the Tom Reed Gold Mines Co. is situated in the western part of the State of Arizona, not far from the California line. The village of Oatman, which consists principally of the officers and employees of the Tom Reed Co., is not reached by the railroad, but communication is established at Kingman, about 20 miles distant. With Kingman, transportation is by means of automobile stage for passengers; machinery and supplies are brought in on wagons and occasionally pack animals.

The situation is in a rocky, desert country, comparatively isolated, the nearest activity being at the Gold Road mine of the U. S. Smelting, Refining & Mining Co., about 1½ miles distant. Aside from this large mine, there is nothing within a much greater distance. Water is scarce and its use has to be governed by great economy. The name of the company is taken from the name of one of the claims which comprise the property.



Tom Reed Mill, Oatman, Ariz., Showing Filter Plant Discharge

General View of Tom Reed Mill

Ore is Gold in Quartz

Gold is the principal valuable metal in the ore, and it occurs generally free in quartz and, to a smaller extent in calcite. The ore is not particularly hard, but requires fairly fine grinding to free the gold and expose it to the action of cyanide solutions.

From $15 to $25 per ton is the general variation in the value of the ore treated in the mill and the average for several months at a time has been near the higher figure. While there is a small amount of silver occurring with the gold, it is not significant and no effort to save it would be worth while. At present the mill treats about 150 tons daily of dry ore, crushing with stamps and regrinding with tube mills. The total-sliming system of cyanidation is followed, crushing in cyanide solution containing 2 lb. KCN per ton. At the point where it is ready for the agitation treatment, the solids in the pulp will average about 70% through a 200-mesh screen and remaining on 100 mesh the quantity is about 1 to 2%, the whole making a product not particularly difficult to agitate.

Treatment Depends on Character of Material

While pulp of this class may be difficult to agitate in those cases when it is largely heavy, granular and devoid of colloid constituent, the governing factor is usually, or ought to be, the fineness necessary to liberate the economically maximum amount of gold. The question of fine grinding has prompted vigorous partizanship for or against it by those metallurgists who believe strongly in extremes of fine grinding or no regrinding at all. Some maintain that extremely fine grinding is wasteful and costly, and that if the grinding is not carried to extremes, agitation of the entire pulp is unnecessary and extravagant. Certainly there are several factors which must be given consideration. Primarily, of course, the cost of fine grinding must be weighed against the additional income furnished by it, and, to be truly profitable, this increased income must be sufficient to cover the cost of regrinding, interest and depreciation on the grinding plant, and leave a profit in addition. Even this comparison alone, however, is not sufficient to justify a proper decision. Part of the material reduced to the so called state of slime is likely to be granular, though fine, and its agitation will cost more than if a true slime, or colloid matter, were being handled. This extra cost of agitation is not to be ignored in an exhaustive search for definite facts.

Contrary to what seems to be the general belief a large proportion of this fine granular material might be successfully leached provided only that it were well cleaned, that is, entirely free of colloid material. If, and when, this gran-

Note—This is the eighteenth, and last, of a series of articles by Mr. Megraw on American cyanide practice. Previous articles appeared Nov. 2, Nov. 23, Dec. 14, Dec. 21, Dec. 28, 1912; Jan. 4, Feb. 8, Feb. 15, Feb. 22, Mar. 1, Mar. 8, Mar. 29, Apr. 5, Apr. 26, May 17, June 14 and July 5, 1913. A new series of articles dealing with comparative details of cyanide practice, as distinguished from this descriptive and discussive series, will begin with an article on "Calculation of Extraction in Cyanidation," will appear on Sept. 6, 1913.

ular material is sufficiently fine to liberate the contained metal and expose it to the action of cyanide solutions, it is more than likely that leaching will provide for recovery of an amount equal to that which could be obtained by agitation, at much less cost. Leaching will take longer to accomplish the same result, but the cost will be less and extraction will be as good in many cases. Also, the installation of a leaching plant costs less than that for agitation, and maintenance expenses and interest are therefore lower. In calculating the cost of leaching plants, however, it should not be forgotten that the separation, meaning a definite and clearly marked separation, of fine, granular material from a slime pulp is not a simple operation and is likely to cost an appreciable sum per ton treated. The most natural deduction is that every problem should receive separate study and be solved according to its requirements. At the Tom Reed plant, the grinding is carried to a fine point where the product is comparatively easy to agitate and gives better extraction; hence the total-sliming treatment.

Stamp-Crushing Practiced

At the Tom Reed mine the ore is hoisted and passed over a grizzly and through a No. 2 Austin gyratory crusher. Thus prepared, the ore is delivered to a long 16-in. conveyor belt which delivers it to the mill bin. From the bin, Challenge feeders supply a battery of 20 stamps of 1250 lb. each, dropping 105 times per minute through 6 in. The material is crushed to pass a 12-mesh screen. Crushing is done in cyanide solution containing 2 lb. KCN per ton and alkalinity equal to about 2 lb. CaO per ton of solution is carried.

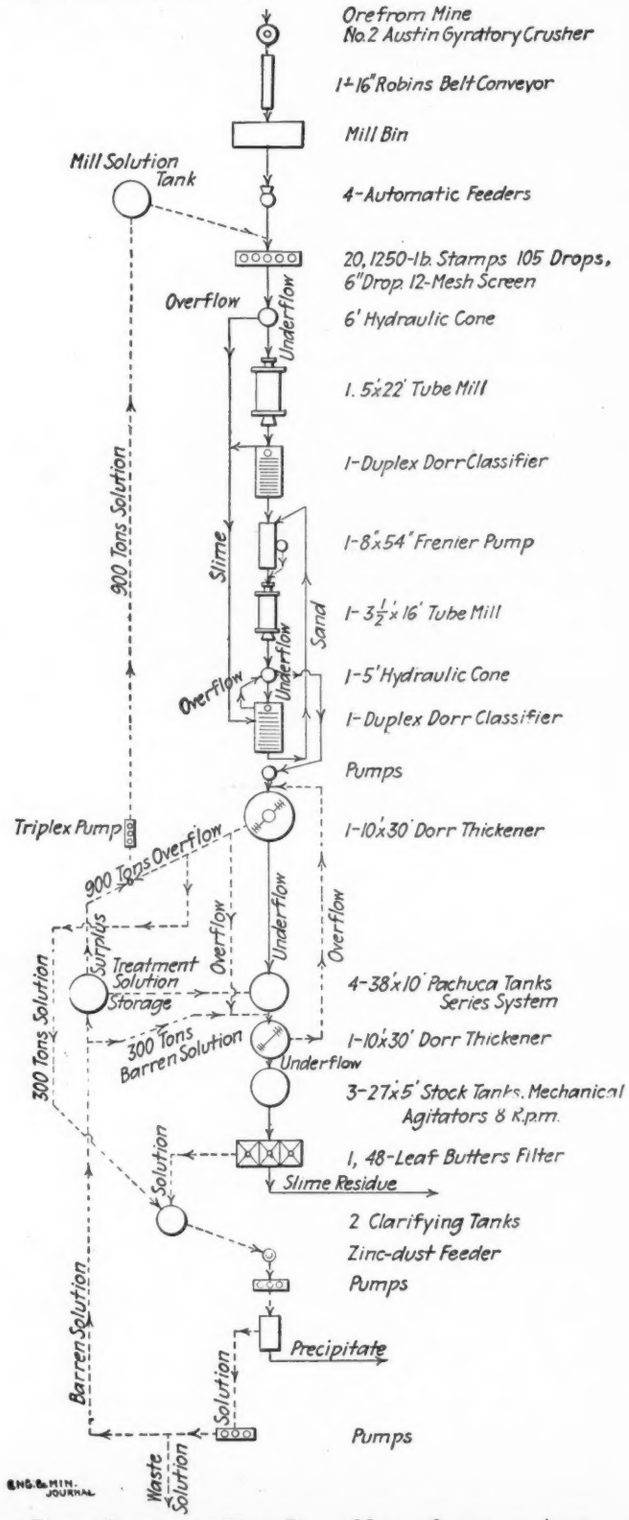
From the stamps the pulp is received in a 6-ft. hydraulic cone, the slime overflowing to a circuit which will be described, and the sand going directly into the first tube mill.

Closed Tube-Mill and Classifier Circuit

Sand, or underflow, from the 6-ft. cone is fed into the first tube mill which is 5x22 ft., and equipped with El Oro lining. From this mill the entire pulp is delivered into a Dorr duplex classifier, from which the slime overflow joins the overflow from the 6-ft. cone first mentioned and the sand is delivered to an 8x54-in. Frenier pump, and thence to the second tube mill. This mill is a small one, 3½x16 ft., and is also fitted with the El Oro lining, which has given good results at this mill. The pebble consumption in these mills is 4 lb. per ton of ore crushed. This small tube mill delivers its product into another hydraulic cone, this one 5 ft. in diameter, whose overflow comprises the stream of total slime going to the agitation system. Its underflow is fed into a second duplex Dorr classifier, the overflow from which returns to the cone and overflows from there into the treatment circuit, while the sand product is taken to the Frenier pump which elevates it, for further grinding, into the small tube mill. It will be noted that the rather complicated flow of pulp through the grinding and separating machines is merely an exceptionally careful system of separating sand and slime so that the pulp for agitation may be uniformly and finely reground.

Agitation in Pachuca Tanks

A 10x30-ft. Dorr thickener receives the slime pulp now prepared for agitation, thickens it to a consistency of about 1:1 and delivers the thickened product to a battery of four 38x10-ft. Pachuca tanks which are operated in series. During agitation treatment the solution is maintained at 3 lb. KCN per ton and 2 lb. CaO per ton. Due to the character of the ore, the chemical consumption of cyanide is so small that it may be disregarded. The total cyanide loss is ¾ lb. per ton of ore milled and is almost entirely mechanical. The lime consumption is about ½ lb. per ton of ore treated.



Flow Sheet of Tom Reed Mill, Oatman, Ariz.

Vacuum Filtration May Be Discarded

Pulp from the agitation tanks is received in another 10x30-ft. Dorr thickener which delivers thickened pulp into a series of stock tanks which are equipped with mechanical agitators, in which the pulp is kept thoroughly mixed until ready for filtration. The overflow is returned to dilute the inflow into the first thickener, the solutions being disposed of, as shown in the accompanying flow sheet. A 48-leaf filter of the stationary vacuum type, or Butters system, is used for filtration, and, although it has proved satisfactory, it will probably be replaced by continuous decantation in the near future, experience and experiments having shown that system to be more economical and quite as efficient. Tailing from the filtering tanks is discharged by gravity into a dam, where the material is skimmed at intervals, as has already been described.[1].

Solutions from the filtration plant are precipitated and returned to a treatment-solution storage tank, from which the solution for treatment is drawn. Any surplus at this point may be returned to the mill-solution tank at the head of the mill, thus maintaining a solution balance without difficulty.

Zinc shavings have been used for a long time for precipitating the gold from cyanide solutions at the Tom Reed mill, but recently the system was changed and the Merrill zinc-dust apparatus installed. The system gives entirely satisfactory results, 420 tons of solution being precipitated in a plant designed to handle only 300 tons. With zinc shavings, the consumption of zinc amounted to 0.25 lb. per ton of ore treated, while with zinc dust only 0.15 lb. is necessary.

The mill crushes an average of 150 tons per day, requires 134 hp. for its operation, and employs 16 men for its regular control. Pebble consumption in the tube mills amounts to 4 lb. per ton of ore crushed. While itemized cost data is not obtainable, the aggregate is $2.50 per ton milled, including the depreciation account. Average extraction is 95% of the gold in the ore.

The Vulture Mill in the Desert

The property of the Vulture Mines Co. is situated about 14 miles southwest of Wickenburg, in central Arizona. The country is practically desert, and water is scarce. There is no available wood for fuel, and, as coal is extremely expensive laid down at the mine, distillate and oil are used entirely to furnish motive power. Power for the mill is furnished by two 150-hp. Nash engines, which are entirely satisfactory.

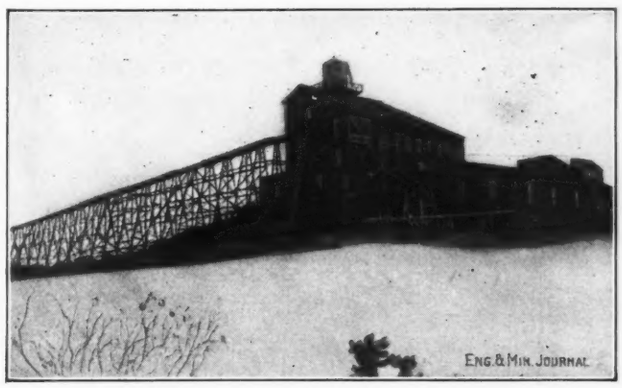
The valuable metal is gold, which occurs in white quartz, together with pyrite and small quantities of galena and chalcopyrite, sometimes banded and sometimes occurring in masses with the pyrite. The present orebody is one which was discovered in 1911, the vein having been faulted and the ore entirely lost. The mine is an old one, having been discovered by H. Wickenburg in 1863. Surrounding country rock is dioritic schist, no igneous intrusions having any influence on the ore deposition. The average milling ore contains gold to the value of approximately $20 per ton. Mine ore is trammed a short distance from the working shaft to the crusher bins, from which it is fed to a gyratory crusher. The crushed ore, which passes a 2-in. ring, drops to a conveyor belt, and is elevated to another ore bin. From this the ore is hoisted over a trestle 700 ft. long to the mill bins by means of a friction hoist on the mill line shaft.

[1]"Eng. and Min. Journ.," Mar. 22, 1913.

Regrinding in Wheeler Pans

The stamp installation consists of twenty 1600-lb. stamps, dropping 98 times per minute through 6½ in., and crushing through a 40-mesh round-aperture screen. Chuck blocks are used, and the ore is subjected to amalgamation inside the mortars.

A Dorr duplex classifier follows the stamps, and separates the pulp into sand and slime. Solution is used throughout the mill, including the stamp-crushing department. The slime portion of the ore is elevated to three Deister slime concentrators, the tailing from which is taken to a series of thickeners. The classified sand is reground in two 5-ft. Wheeler pans, which make 42 r.p.m., and each is capable of grinding 35 tons per day, 85% of which passes a 100-mesh screen. The consumption of iron amounts to about one pound per ton of ore treated.



Vulture Mill, Wickenburg, Ariz., Showing Inclined Tramway for Ore Delivery

From the two grinding pans, the ground pulp passes to four Wilfley concentrators, the high-grade sulphide being here removed, and the tailing from the tables is again reground in a third Wheeler pan, identical with the other two. The product of this third pan is sent directly into the first of a series of continuous thickening tanks, together with the slime from the Deister concentrators. In this series of thickeners, there is continuous decantation and thickening of pulp, followed by a thinning by means of weaker solutions. Water for final washing enters the last thickener and progresses to the first in a direction contrary to that of the moving pulp. The accompanying flow-sheet diagram shows the movement of the pulp and solutions in the thickener series, as well as in the rest of the mill. No filter is in use and the final thickener is required to discharge the pulp at the maximum possible thickness.

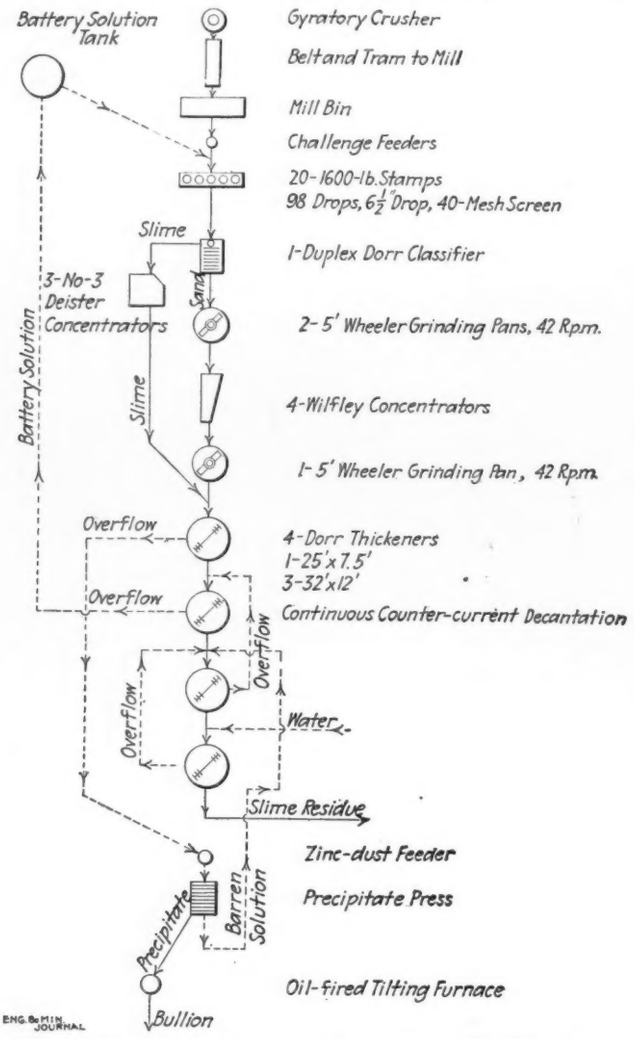
It will be noted that there are no tanks for agitation of the pulp, the operation being practically grinding, concentrating, washing and discharging. The operators, however, believe that better results could be obtained by using one or two agitation tanks ahead of the thickener series, and such tanks will probably be installed in the near future.

Zinc dust is used as a precipitant, a feeder of the belt type being installed. A precipitate press of the Merrill

triangular type having sixteen 36-in. frames, is used to collect the precipitate, which is not acid treated, but is melted directly in an oil-fired tilting furnace and the bullion shipped. Slags formed in the melting are periodically smelted in a small blast furnace, the lead bullion cupelled and the product added to the regular output of the mill.

Continuous Decantation Successful

It is of particular interest to note that in the two modern and efficient plants described here, experiment has shown that expensive filtration plants may be considered superfluous. At the Tom Reed mill, where a filtration plant was originally installed, it will be superseded by continuous decantation, resulting in a material economy, while at the Vulture, no filter has been installed, the series of four thickeners satisfactorily doing the work. In practice the thickeners deliver a product which is acceptable from the point of view of contained moisture. The first of the series at the Vulture mill delivers a product containing 31% moisture; the second, 43%; the third, 42%; and the fourth and final one, 35% moisture. If necessary, the thickener can deliver a product containing as little as 25% moisture on a slime which settles rapidly. It is not too much to say that on the same material, the vacuum filter cannot do a great deal better than the thickener, considering all points at their real value. In the statements that are made here in this connection, reference is made solely to the treatment of gold ores of milling grade. Silver ores, requiring solution of greater cyanide strength, may be treated by a variation of the system which will be mentioned in a later article.



Flow Sheet of Vulture Mill, Wickenburg, Ariz.

Vulture Slime Not Particularly Fine

Extremely fine grinding is not required on the Vulture ore to secure the economically maximum extraction. Classification stated in the accompanying table shows the condition of the pulp undergoing treatment.

CLASSIFICATION OF SLIME PULP

+ 80 mesh	12.0%
+ 100 mesh	2.5%
+ 150 mesh	23.5%
+ 200 mesh	16.5%
— 200 mesh	45.5%

Solution is used throughout the mill, usually maintained at about 2.1 lb. KCN per ton of solution. Lime is added at the mortars in sufficient quantity to maintain an alkaline condition.

About 1 lb. of KCN is consumed in treatment, 2 lb. of lime and 0.4 lb. zinc, in the form of zinc dust. Costs, while not at present available for publication, are reasonable in view of the adverse conditions already mentioned. These Arizona plants are particularly instructive as examples of first-class operation under difficulties.

Attempt to Stimulate Bromine Consumption

A prize of £500 is offered by the German Bromine Convention to the discoverer of a process or compound leading to a new an increased consumption of bromine (*Chem. and Drug.*, May 17, 1913). For many years past the production of the existing German bromine factories has far exceeded the consumption, so that a fresh field of use is urgently required.

The following are some of the conditions attached to this competition: The new discovery must represent a technical innovation, and must not adversely affect existing uses of bromine. The process must be applied in practice at the latest one year after the awarding of the prize. The process must, in the opinion of the jury, lead to a considerable increase in the European consumption of bromine at a suitable price. Competitors must send in their processes at the latest by Jan. 1, 1914, to the Deutsche Bromkonvention G. m. b. H., Leopoldshall-Stassfurt.

Machine Drilling Contest

The Fourth of July drilling contest, at Cripple Creek, seems to have been dominated by the machine drilling this year. Reports of the contest are highly interesting. The winning machine was a 16-V Waugh, which drilled 20 ft. $6\frac{11}{16}$ in. in 15 min. All machines used ½-in. air connections and drilled from the end of a ¾-in. hose, 50 ft. long. The steel was all of cruciform section with a high-center bit and not a single piece in the entire test broke, battered or chipped. Of other machines in the contest, an Ingersoll-Rand drilled 13 ft. $5\frac{3}{16}$ in., and a McFarlane, 6 ft. $^{6}/_{16}$ in. in 10 min., when the connection broke so that the full 15 min. was not employed.

Experiments with an Oil-Burning Shaft Furnace

By Albert L. Waters*

SYNOPSIS—A record of experiments on an oil-burning shaft furnace. The experiments were promising, but had to be abandoned for lack of capital. Further investigation is indicated.

In the fall of 1909, I was employed by the distinguished mechanical and metallurgical engineer, John W. Nesmith, founder and for many years president of the Colorado Iron Works Co., of Denver, who had patented and was experimenting with an oil-burning blast furnace in the yards of his works at Denver and wanted a metallurgist to assist him. An ordinary blast furnace, 42 in. in diameter, had been fitted with the oil-burning attachment. For over a year previous to 1909, Mr. Nesmith, for demonstration purposes, had started this furnace frequently in the mornings and operated it smoothly until the end of the working day. He felt that it was a demonstrated success which would be taken up soon by the big operators at such points in the West where crude-oil fuel would prove cheaper than coke. He believed that he had made a great contribution to metallurgical science and that it was the crowning act of a long and successful life which had given so many mechanical improvements in the early smelting practice of the West. It was pointed out to Mr. Nesmith that a single day's operation did not mean complete mastery of the problem and preparations were being made for a two weeks' continuous run when this remarkable pioneer was suddenly called over the divide.

Oil-Burning Smelting Plant

Converted into a Coke Furnace

Construction of the Original Oil-Burning Shaft Furnace

It then fell to my lot to carry on the work and the furnace was prepared for the campaign. One side of the furnace had been removed from the crucible upward for 6 ft. and new short jackets made to fill the space from the feed floor to the top of the combustion chamber, which was a cylindrical drum of boiler iron 6 ft. in diameter and 18 ft. long. This was lined with firebrick with a space at the top between the iron and the brick 18 in. deep where the blast entered, passed over the back of the firebrick arch and entered with the oil at the end of the chamber. Two simple, long-flame burners burned the oil. Ore was charged by shovel with care that the finest part of the charge fell where the oil flame entered the shaft. The inventor had found that the oil must be entirely burned before striking the charge in the shaft of the furnace. This intense flame under pressure melted the charge and the molten products flowed into the combustion chamber, from which they were tapped out into a small forehearth or settler.

Experiments proved that too short a distance between burner and charge resulted in lamp black being condensed on the surface of the viscid, partly fused face of ore in the shaft; the lamp black became incorporated in the mass where it could not be touched by the oxygen and so was unburnable and infusible. Balls of this refractory mixture sooner or later froze up the furnace wherever oil burning in shaft furnaces has been tried in the West so far as I know. The long combustion chamber got away from this trouble and for the first eight to 10 hr. after blowing in the furnace it ran hot and freely, the slags were clean and the entire experiment highly encouraging. In about 14 hr. serious trouble started invariably. At first reasons were supposed to have been found for it, bad feeding, irregular blast, and the like, but after four trials it was discovered that the thick crusts found in the throat of the furnace where the ore and flame met were largely magnetite, probably caused by the superoxidizing hot blast. To avoid this condition 2% of coke was added to act as a reducing agent and no further trouble was experienced. Five per cent. of coke was tried to see if it would increase the speed. The furnace would speed up usually for about three hours and then drop back to its normal capacity of 30 to 40 tons per day of 24 hours.

Charge Composition

The charge was made up of low-grade sulphide copper ore carrying some magnetite and blende from the Yak Tunnel at Leadville. Some carbonate copper ores were purchased near Salida and the silica flux used was a low-grade gold ore from Gilpin County which carried 18% alumina. With the magnetite, blende and alumina, the charge was not what might be called an easy one. During these operations there was smelted 715,572 lb. of charge, which required 6738 gal. of crude oil or 18.8

*Mining engineer, Tucson, Ariz.

gal. per ton of charge smelted. If we deduct 25 gal. per hr. for the 20 hr. consumed in the various blowings-in, we would have a consumption of 17 gal. per ton of charge smelted. The best run for 24 hr. was 80 tons of charge with a consumption of 11.8 gal. of oil per ton of charge. The slags were held at between 36 and 38% silica, and the lime between 8 and 12%. The balance was mainly iron with alumina and zinc. The copper in the slag ran from 0.2 to 0.4% and the matte averaged about 42% copper. Toward the end of the tests considerable trouble was experienced because of the burning out of the firebrick lining of the combustion chamber.

About a year before these tests were made a company of New York men had contracted for a complete smelting plant to use this system in Arizona. As I was the only person who then was familiar with the advantages and disadvantages of the crude-oil furnace, it naturally fell to my lot to direct the erection and operation of this new and larger plant in Arizona. T. A. Dickson, a chemist and metallurgist well and favorably known at Salt Lake and Goldfield, who had been my assistant in Denver, became associated with the undertaking at this time and much of the data which follows is taken from his reports as superintendent of the plant.

Operations on a Large Scale

The furnace was an ordinary water-jacketed copper-matting furnace, 36x108 in. at the tuyeres, with a heavy bosh. A brick-lined steel combustion chamber was attached to one side. It was about 18 ft. long by 10 ft. wide by 4 ft. 6 in. high. The inner brick-arch radius was 16 ft. The end of the chamber away from the furnace had four specially designed long-flame crude-oil burners, three peep holes and two compressed-air flue-dust injectors for throwing flue-dust and concentrates into the combustion chamber. All blast was brought in over the top between the brick arch and the steel shell and passed into the combustion chamber around the burners. The floor and sides were carefully lined with best quality Harbison-Walker magnesite brick. The arch was silica brick. Chrome brick were placed between the acid and basic brick. The brickwork was thoroughly seasoned and slow fired before use.

Three classes of ore were combined to make up the greater part of the charge, whose analyses ran about as follows:

	Cu %	Fe %	CaO %	SiO_2 %	S %
A	5	44	2	27	7
B	4	20	22	36	0
C	2	26	14	24	20

These ores contained considerable fines, but their physical condition was classed by Mr. Dickson as fair. The ore *A* contained much magnetite and gave the usual trouble in the furnace through a tendency to form mushy crusts in the combustion chamber and in the forehearth.

The Usual Infantile Troubles Begin

The plant was blown in early in 1912. The furnace started smelting with remarkable smoothness and speed, but considerable trouble developed in the power house and then with the burners, for which the system could be blamed in no way. The furnace was shut down four hours, but in 22 min. after putting on the blast it was running so fast that the blast had to be repeatedly cut to enable the men to get the slag away fast enough. Then burner trouble shut the furnace down for five days and a solid mass of slag and matte 18 in. thick froze in the combustion chamber, which was used as a crucible. When firing was resumed it took only six hours to melt out this mass in the combustion chamber and to have the furnace running at a good rate. The next day the silica brick around the trap spout in the combustion chamber burned out, causing a bad runaway and draining the furnace. This performance was repeated each day for two more days, when the trap spout was abandoned and intermittent tapping resorted to. Next some trouble was experienced through the shutting off of the air passages through the charge at the throat of the furnace where the combustion chamber and shaft joined. These crusts were largely magnetite coming from the ore *A*, and I believe that a great deal was formed by the superheated blast. Coke was tried as a reducing agent, as had been done successfully at Denver, to do away with these crusts, but the throat was so much larger that the coke simply rolled through into the chamber without doing any good.

During the later runs no attempt was made to use a trap spout, as it was impossible to maintain the brick breasts with magnesite, chrome, silica, or Golden firebrick. From midnight of May 11 until noon of May 15 the furnace was in continuous operation. It was then found necessary to shut down owing to excessive cutting away of the sides and bottom linings of the combustion chamber. During this last run a Cyclone burner, made in Los Angeles, was tested and gave very much better satisfaction than those which were sent with the furnace. The following table will give an idea of what was accomplished by these experiments, which were carried further and on a larger scale than was ever done before so far as I know.

DATA ON OIL SMELTING IN THE BLAST FURNACE

Date	Hours	Tons smelted	Oil used, gal.	Oil per ton, gal.	No. of Burners
April 24	24	85.0	1743	20.5	4
May 3	24	64.5	1180	18.2	2
May 4	24	70.2	1235	17.6	2
May 5	24	51.3	1455	28.3	4
May 11	8	14.5	500	34.4	4
May 12	24	60.2	2185	36.3	4
May 13	24	60.4	1820	30.1	4
May 14	24	72.0	1910	26.9	4

The oil was California crude, asphalt base, 18 deg. The time of the entire experiment was 264 hours; longest continued run, 86 hours; total tons smelted, 651.037; average tons per day, 59.1; average oil consumption, including heating up and blowing in, 29.4 gal. per ton of charge. Taking the seven full days' run, the average was 66.2 tons per day, consuming 24.8 gal. per ton of charge.

It would appear that too many burners were being used and this may account for the destruction of the linings. Typical slags run were as follows:

FeO %	CaO %	SiO_2 %
43.5	10.7	36.0
43.3	12.0	35.4
32.5	17.6	39.6
36.9	17.7	37.4

The copper contents ran from a trace to 0.2% when the trap spout was used and rose to 0.9 with intermittent tapping, which was caused, probably, by the rush of slag through the small settler and by the high copper content of the matte, which ran from 45% to 74% copper. The slag losses seemed to have been purely mechanical.

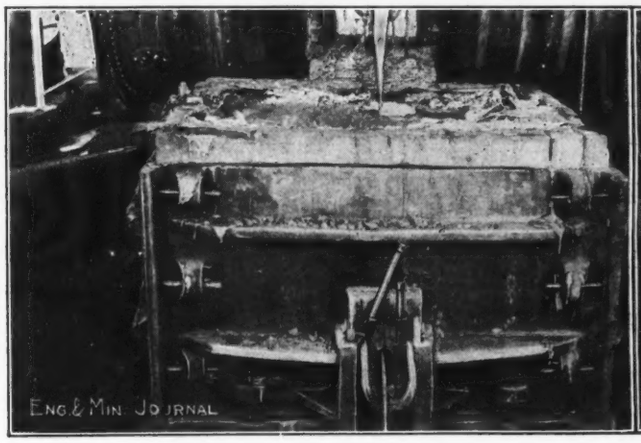
The company was not sufficiently strong to carry on these experiments and I converted the furnace into a

coke burner by closing up the combustion-chamber side with firebrick protected by water pipes and leaving a 4-in. slot across the entire side of the furnace for a tuyere until proper water jackets could be provided for the combustion-chamber side. The furnace ran without any difficulty for over 30 days in this way and smelted as high as 215 tons of charge per day of 24 hours.

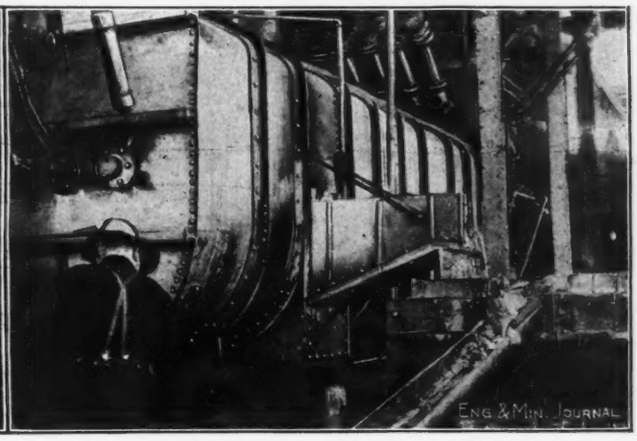
Conclusions

There is no doubt in my mind that copper ores can be smelted in a shaft furnace with oil fuel alone. With ores low in sulphur, some coke or other solid reducing agent may have to be used to protect the sulphur and to avoid magnetite crusts. Where an important consideration is the elimination of sulphur and its use as fuel, then the superheated, powerfully oxidizing blast of the hydrocarbon furnace will prove of particular value. The oil used should be about 15 gal. per ton of charge smelted. Where 15 gal. of crude petroleum costs the same or less than 240 lb. of fair coke, its use is worth while investigating, and where 20 gal. of crude oil cost the same or less than 240 lb. of fair coke, its use is strongly indicated. There is no doubt but what two combustion chambers should be used instead of one, and there is a question if there should not be one chamber for each lower jacket of the furnace. In that case the furnace would be operated with an inside crucible and ordinary end or side trap spout, and it is believed that the formation of crusts and the destruction of refractory lining would be entirely eliminated.

It is no proposition for a small new company to consider. It should be carefully worked out by some strong company, having other furnaces in operation and room for a small experimental furnace, say 36 in. by 36 in., in some convenient space where it can be given power, blast and slag-handling facilities. The strong company which is first to secure and perfect this system will make a great step forward and, in California or Arizona, or wherever a cheap oil supply can be had, will reduce its smelting costs by 60c. to $1 per ton of charge smelted in shaft furnaces.



Settler and Slag Tap



Oil-Fired Shaft Furnace

A Pump Man at the Leonard Mine, in Butte, Fell 550 Ft. to his death in a shaft on July 11. He appeared to have been fixing drained-boards in the man-cage compartment and was hit by the cage from below. His badly mangled body was found in the sump. The Leonard has been extremely unfortunate this year in the number of its accidents.

Nickel Developments at Sudbury

Special Correspondence

The recently organized Canadian Nickel Co., successor to the Dominion Nickel-Copper Co., is rumored to be negotiating a deal by which the Mond Nickel Co. will become interested in a large way in the new company, or by which the Mond company will purchase the large holdings of Canadian Nickel. The basis of the rumor is the fact that engineers for the Mond company have recently been given full access to the drilling data of the Murray mine and also the apparent halting of the plans of the new company to erect smelting and refining works. Officially, nothing can be learned as to the reported deal.

It is understood that one of the reasons for the reported deal is the difficulty which has been experienced abroad in financing a deal of this magnitude and kind. The new company has already paid several million dollars to Messrs. J. R. Booth, M. J. O'Brien and associates for the control of the property and a large preliminary expenditure in exploration and general plans has been made since the sale was consummated during the last months of 1912. The drilling expenditure on the Murray mine alone has amounted to upward of $20,000 monthly. A large staff has been engaged in planning and detailing the extensive smelting plant projected. Work on sinking a working shaft at the Murray mine is under way. The new company announced that it would use the Hybinette refining process and that it would refine in Ontario. The work has been carried on under the direction of J. E. McAllister, of Montreal, formerly of British Columbia, with J. A. Holmes in local charge. W. C. H. Wilson, formerly of Greenwood, British Columbia, has acted as general auditor and business manager.

Practically all of the exploration recently has been on the Murray orebody and its extension onto the ground of the Elsie mine, purchased from the Lake Superior Corporation. It is reported that a large tonnage has been proved at the Murray. Unofficial estimates run from 5,000,000 to 8,000,000 tons. This is said to average 3 to 3½% combined nickel and copper and much of it better. The company also owns proved or partly proved nickel properties elsewhere in the district, including the groups at Nickel Lake, Joe Lake and the Whistle on the North range and the Victor mine on Blue Lake, prop-

erties in Falconbridge township and other South range properties in the vicinity of the Murray mine. In all, the holdings cover 37,000 acres and are second to and nearly equal to those of the International Nickel Co. The proved tonnage, it is claimed, is equal to that of the International.

The Mond Nickel Co. has just blown in its new plant, at Conniston, and is in need of new and large ore reserves to satisfy the 1000-ton smelting capacity. It has recently renewed exploration activity, and has secured by purchase or option, the Levack properties, the Kirkwood, Worthington and Blezard mines. The present chief supply of this company is from the Garson mine, but some ore is still coming from the Victoria. It is preparing to operate the Kirkwood and is drilling the Worthington and the Levack No. 1. The work of sinking the deep shaft on the tract near the old Froud mine purchased three years ago, is being delayed by water, but it is expected that this property will soon be ready to produce ore for the Conniston plant.

Twenty-seven diamond drills are now engaged in exploration work in the Sudbury district, distributed as follows: Canadian Copper Co., two on Creighton mine and four at Froud (No. 3); Mond Nickel Co., nine in Levack township on the Tough-Stobie options, one at the recently purchased Worthington mine and one on the Little Stobie in Blezard township; Canadian Nickel Co., nine on the Murray mine, McKim township; the Rae syndicate, one on Lot 11, 6th Concession, McKim.

The Canadian Copper Co. and the Canadian Nickel Co. are engaged in developing orebodies already proved. The Mond Nickel Co. works in Levack township is now chiefly confined to the No. 1 Levack outcrop in Lot 10, 2d Concession. Work on the Big Levack outcrop, Lot 2, 4th Concession, was started, but was discontinued for a time. The Big Levack has been drilled several times, once before by the Mond company and recently by the Miller syndicate. The adjoining Strathcona property was drilled by the Canadian Copper Co. last year, and relinquished.

Drilling results on the Murray mine are attracting attention. This property was purchased from the H. H. Vivian estate, of Swansea, Wales, in April, 1912, by the Dominion Nickel Copper Co. for $125,000, after it had been idle and offered at this price or less for more than 10 years. It has a strong outcrop and at one time furnished the chief supply for a smelting plant at the mine, operated by the Vivians. It was drilled by several interests, more recently the Mond Nickel Co., and in each case relinquished. The Dominion company, on acquiring control, inaugurated an extensive drilling program and almost immediately found an extension of the ore from the old mine which has been followed up and found to be enormous.

The fortunate discovery of this large orebody enabled the Dominion company, controlled by Messrs. J. R. Booth, of Ottawa, and M. J. O'Brien, of Montreal, to sell out advantageously to a syndicate organized through Dr. F. S. Pearson, of New York and Montreal. The new company is continuing its exploration operations to define the orebody and to increase the reserves as a basis for an extensive financing plan. It is reported that in June over a million tons of new ore was developed by drilling on the Murray. The orebody flattens from the contact and is practically continuous up to 1800 ft. from the contact, where it is about 1000 ft. below the surface. Drilling in Lot 11, 6th Concession, of McKim township, is under control of Charles McRea, of Sudbury, and is based on the expectation of finding extensions of the Murray mineralization in that direction. The Guggenheim interests of New York last year drilled Lot 10, adjoining, and found little ore on the contact. After the Guggenheim engineers had relinquished the option on this property, the owners were not satisfied and put down a drill hole 600 ft. into the basal granite, but found no ore. The monthly expenditure for diamond drilling in the district now is more than $50,000. Most of the work is done on contract on a basis of $3 to $3.50 per ft. The rock is not hard to cut and good cores are obtainable generally. In some cases there is a sand and gravel overburden upward of 100 ft.

It is likely that much more drilling will be undertaken in the district in the future to test out the numerous undeveloped outcrops, or "burns," as they are called locally, which are found at frequent intervals along the 120 or more miles of contact now definitely defined and mapped. The experience at the Murray has given an impulse and basis for more courageous exploration in the district than has as yet been undertaken.

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Granby Development at Hidden Creek

The Hidden Creek mine of the Granby Consolidated Mining, Smelting & Power Co., in the Portland Canal district, B. C., is now sufficiently developed to ship the estimated smelting-plant requirement of 2000 tons per day. It is estimated that there is approximately 8,000,000 tons of ore in sight. The difference in elevation between the highest exposure of ore on the property and the lowest, in a series of tunnels, is 865 ft., and between the upper exposure of ore and the deepest diamond-drill hole, sunk to a point 300 ft. below sea level, there is a vertical depth of nearly 1500 ft. This will convey some idea of the area of ground that has proven to be ore-bearing. The last cores showing mineral taken from the deepest drill holes gave assays of 6 and 11% copper. Mining costs will be reduced to a minimum. All the ore will fall by gravity through raises connecting the various tunnel levels. The lowest tunnel, which will be the main outlet, will be widened from the portal a distance of 400 ft. in order to permit the laying of double tracks therein. Ore trains will back into this opening and the cars will be automatically loaded. Between the tunnels there will also be storage pockets with a total holding capacity of 15,000 tons. Between the lowest tunnel and the next tunnel above, a large excavation has been made for the installation of a crushing plant through which all the ore will pass in its descent from the various workings. The crusher capacity will be 200 tons per hr. Below the crusher are five 400-ton ore pockets. About 4⅓ miles of railway tracks, extending from the mine to the smelting plant and ore-docks, have already been built. Near the works is located the electric-power plant, directly connected with the blowers. The power plant, beside furnishing power for operating the mine and works, will also light the new town that is now rapidly being built up.

Ontario Metal Production

Returns made to the Bureau of Mines show that the metal output of Ontario for the first quarter of 1913 was as shown in the accompanying table. The principal gold

ONTARIO METAL PRODUCTION FOR FIRST QUARTER 1913

Product	Unit	Quantity
Gold	Oz.	50,637
Silver	Oz.	7,264,559
Copper	Tons	3,075
Nickel	Tons	6,311
Iron ore	Tons	15,389
Pig iron	Tons	181,042
Cobalt and nickel oxides	Lb.	280,096

producers are the Hollinger and Dome, but the McEnany and MacIntyre also contributed, as well as the Cordova in Hastings County, and the Canadian Exploration Co. at Long Lake. The Foster-Tough mine at the new camp of Kirkland Lake is turning out some rich ore. The quantity of ore milled in all was 69,905 tons, the average yield of gold being thus a little under ¾ oz. per ton.

The production of silver was nearly equal to that for the corresponding period of last year, being only some 74,485 oz. less. The mines of Cobalt proper furnished 7,253,595 oz.; South Lorrain, 198,381 oz.; Gowganda, 54,350 oz., and from gold bullion, 10,964 oz. Shipments amounted to 7053 tons ore; 2130 tons concentrates, and 1,926,160 oz. of bullion. Silver refineries in Ontario recovered 2,754,292 ounces.

The Sudbury mines yielded 1589 tons more of nickel and 538 tons more of copper than during the first three months of 1912. The producing companies are the Canadian Copper Co. and the Mond Nickel Co., but a third company which acquired the holdings of the Dominion Nickel-Copper Co. is actively preparing for production.

⁂

World's Emery Supply

The world's supply of emery comes from Greek islands and from Asia Minor, near Smyrna. Importations into the United States, which average $250,000 annually, have been hampered within the past year because of disturbed conditions in the Balkans. In this connection the following dispatch from Athens (*Daily Consular and Trade Reports,* June 30, 1913) will be of interest:

It is thought that the bill passed by the Greek Chamber regulating the emery trade of Naxos, one of the Greek islands supplying a large proportion of the world's requirements of soft-polishing emery, will result in the speedy settlement of the strike for higher wages of the workers engaged in obtaining the mineral. The minimum selling price of Naxos emery is fixed by the bill at 65 francs ($12.54) per metric ton (2204.6 pounds), while first-grade emery must not be sold below 110 francs ($21.23) per metric ton. The grading of the mineral will be under the control of three Government officials stationed on the island, and all sales have to be checked by a special agent stationed on the neighboring island of Syra, where the product has to be shipped after sorting. The agent will give a certificate with each lot sold, which will contain particulars regarding the quantity, quality, selling price, and steamer by which reshipment will be made. Heavy penalties will be enforced in cases where false information on these points is given.

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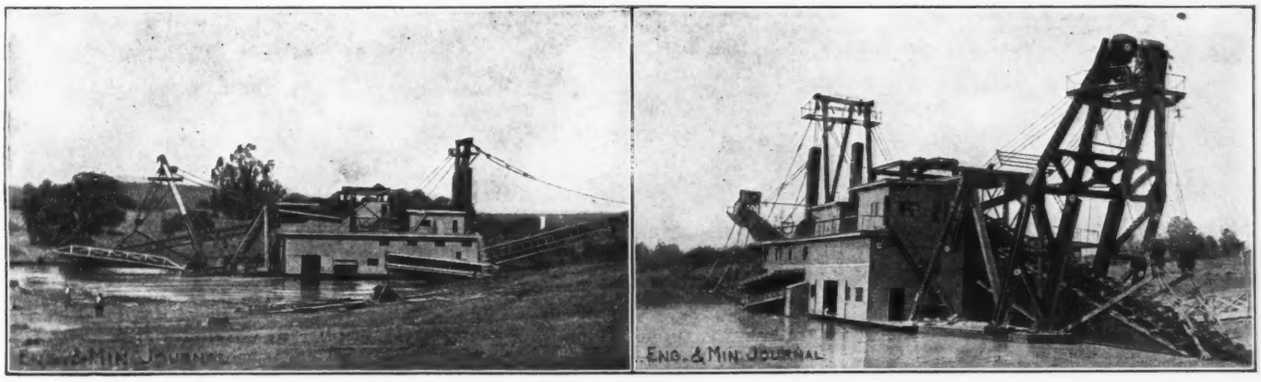
Gold Dredging in California

SPECIAL CORRESPONDENCE

Natoma Dredge No. 7, built by Paul E. Morse, was started to work at 4:30 p.m., May 12, and has run continuously ever since except for the usual stops for oiling, etc. No. 7 is a new steel dredge built to replace old Natoma No. 7, which went out of commission about a year ago. Actual work was begun on Jan. 2, 1913, and the 4 mos. 10d. elapsed time makes a record of dredge construction for boats of this size. No. 10, a larger boat, was built also by Mr. Morse, in 5 mos. 21 d., which was considered quick work.

No. 7 is 134 ft. 8 in. long, 46 ft. 3 in. wide and 9 ft. 6 in. depth of hull, and has buckets of 9 cu.ft. capacity, the ladder carrying 98 buckets. She is considered the finest dredge yet built, special attention being given to ease of getting to all parts of the boat through



A NEW CALIFORNIA DREDGE, NATOMA NO. 7

carefully planned walkways, platforms, and stairways, all of steel, as well as safeguards from danger to employees.

Work has been started on the shops and camp at the site of Yuba No. 14 at Hammonton. No. 14 also will be built of steel and will be the largest gold dredge yet built, being somewhat larger than Yuba No. 13, which was built two years ago at Hammonton.

⁂

Decomposition of Lead Sulphate by Ferric Oxide

When lead sulphate is heated in a current of air, decomposition is insignificant below 900° C, says O. Proske, in *Metall und Erz.* Above this temperature active decomposition sets in, and at 1100° C. the whole of the sulphur trioxide is driven off. The presence of ferric oxide causes a greater decomposition at a given temperature, but not to the same extent that silica does, and ferric oxide which has been heated to 1200° C. is more effective than ordinary red oxide. Ferrous oxide when mixed with lead sulphate is oxidized only by the air at temperatures below 800° C., but at higher temperatures is oxidized partly by oxygen derived from lead sulphate.

Applied Geology, Michigan Iron Ranges

By P. B. McDonald*

SYNOPSIS—Outcrops not extensive on Michigan iron ranges. Much prospecting is therefore done with the diamond drill, especially in soil-covered regions. Excellent results obtained and valuable finds made. Drilling should be directed by a competent geologist in order to avoid expensive mistakes. Illustrated examples of successful and unsuccessful diamond drilling.

The early method of exploration for iron ore in the Lake Superior district was to find a good-looking outcrop of ore formation and sink a test shaft, extensions being traced by pits and trenches. In some of the older districts lines of test pits can be followed across the formation through woods and fields for half a mile or more. On account of the difficulty of sinking test shafts through the thick overburden in swamps these generally favorable areas for concentration could be prospected only along their margins.

The customary plan today is to diamond-drill for concentrated deposits of ore at depth, since all the surface showings have long been taken up. Swamps can be drilled almost as conveniently as higher ground, either by laying corduroy roads for transporting machinery and coal, or by doing the work in winter when access is easy. It is not uncommon to drill under a lake by setting up the drill on the ice; this was done on Lake Michigamme by the Oliver Iron Mining Company.

Diamond Drilling Should Be Directed by Competent Geologists

In some cases, as in the Negaunee basin, courageous operators have drilled over 1500 ft. in jasper and lean ore before finding merchantable deposits. Diamond drilling costs, on the average, $3 per foot. On account of the presence of several barren formations, such as iron-stained slates, oxidized dikes, etc., which resemble quite closely the leaner phases of the ore formation, there is need of an experienced man to direct the starting and stopping of drill-holes, in order to avoid useless drilling. Moreover the best orebodies are found in folds and intersections, requiring that close geological relationships be worked out. Several of the mining companies which are expanding, maintain geological departments for the supervision of diamond drilling and general exploration work, and usually these departments have proved profitable.

Variations in Geology of Different Ranges

The general geology of the iron ores on all three ranges of Michigan is the same; the detailed geology is quite different. In general, the iron lies in what is called "ore formation," a series of sedimentary beds of both fragmental and chemically deposited material; ore formation includes iron ores, lean ores, iron carbonate and silicates, jasper, chert, and various mixtures of iron and silica, with slaty phases common. Typical ore formation is banded, with alternate layers of iron oxide, silica or carbonate; leaching of the ore formation by underground waters has concentrated the iron into merchantable ores. In the Iron River and Crystal Falls districts the ore formation is commonly less than 300 ft. thick and occurs irregularly distributed at several different horizons in discontinuous lenses through black and gray slates.

On the Marquette range the ore formation is thicker, being often over 1000 ft., and occupies a much wider and more definite area on the surface. In all districts its original thickness, as just given, is often increased several times by folding or faulting of the strata. Associated closely with the ore formation on all ranges are slates, "greenstone" or diorite dikes, quartzite and usually dolomite. The slates and quartzite are commonly bedded parallel with the ore formation, being sedimentary rocks, but the dikes, being igneous intrusions, cut at any angle across the ore formation and are of variable shape. Ore is usually found in large troughs, more or less complex, where the ore formation is folded or intersects a dike. The actual occurrences, as proved by mining and diamond drilling, are so different and irregular that several definite cases will be described.

Examples of Successful Drilling

Fig. 1, from the Marquette range, shows a diamond-drill hole 600 ft. deep which has cut 150 ft. of ore. Two outcrops showed on the surface; one was a hill composed of a coarse, green, diorite dike, the other was a low mound showing Goodrich quartzite, which usually overlies ore formation on the Marquette range; at the base of the quartzite was a small showing of hard ore formation and contact conglomerate, dipping away from the dike. It was inferred from this that a diamond-drill hole across the formation and cutting the dike at depth would be likely to find a concentration on the dike, and this belief was borne out by results. Another favorable place to explore for ore in the section shown in Fig. 1 would be just under the Goodrich quartzite, where the hard ores of the Marquette district are usually found; however, most of these hard-ore horizons were explored and mined in early days.

Fig. 2, also from the Marquette range, shows a diamond-drill hole 400 ft. deep cutting 200 ft. of ore. The only outcrop is a ridge of pinkish Ajibik quartzite, a rock known to underlie the Siamo slate which usually forms the foot wall of the ore formation. After some trouble, the dip of the quartzite was determined; it being not readily discernible, as the quartzite was rounded and cross-cracked by weathering. The diamond-drill hole was started far enough back from the quartzite to allow for a good thickness of Siamo slate, and the hole was pointed to cut the formation approximately at right angles.

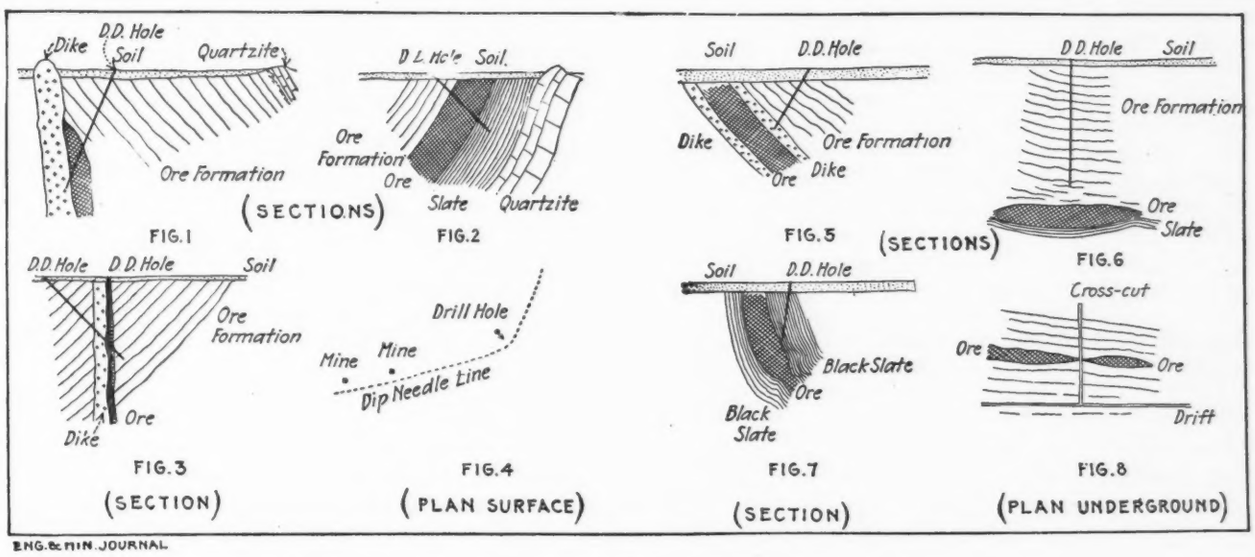
In many localities where the iron formation and foot-wall slates are covered by thick overburden, their general trend can be traced by outcrops and ridges of parallel-bedded quartzite which, being harder than the other rocks, shows more frequently in outcrops or in "hog-backs."

In Fig. 3, from the Marquette range, are shown two diamond-drill holes. The first was drilled at an angle across the dip of the formation for general results, and encountered an 80-ft. dike with merchantable ore lying

*Mining engineer, Gouverneur, N. Y.

along the further side. Such a dike makes a favorable place for concentration, as water leaching down the dip of the ore formation is halted at the dike, which in this case was found to be several thousand feet long. A vertical hole was then drilled alongside the dike, after trying two or three churn-drill holes through the soil to locate the dike on the surface. The vertical hole found ore for 750 ft. in depth, which, with an average width of 30 ft., made 1,500,000 tons for 1000 ft. in length, a fair-sized deposit.

Fig. 4 is from the Amasa district, and is a plan of surface operations, illustrating the value of dip-needle work in a drift-covered country. Two mines were known to have fair-sized orebodies, but extensions of the ore had been difficult to trace because there were no outcrops and the surface soil was 100 ft. thick, making exploration expensive. There was found to be a line of maximum magnetic attraction which passed about 300 ft. from the mines. This line may have been due to magnetite in the slate foot wall, in the ore, or in the hanging wall. The dip-needle line served to indicate the general direction of the formations, and showed a bend in the strata about



EXAMPLES OF SUCCESSFUL AND UNSUCCESSFUL DIAMOND DRILLING

a mile from the mines. Such a bend or angle is a favorable place to look for ore, as a pocket is there likely to exist in the foot-wall slates. A diamond-drill hole was therefore located at the bend in the formation, as indicated by the line of maximum attraction of the dip needle, and was placed about the same distance back from the line as the shafts.

EXAMPLES OF UNNECESSARY FAILURE

In Fig. 5, from the Crystal Falls district, is illustrated a drift-covered country with a diamond-drill hole which was stopped in a fine-grained, gray dike because the core from the dike was not examined closely and was mistaken for the foot-wall slate. Later, another company, better advised, drilled through the dike and found 100 ft. of ore concentrated between two dikes intruded nearly parallel to the ore formation. The second company had the benefit of the services of an experienced geologist, who examined under a miscrocope the core samples from the dike and determined that they were not slate. Frequently it is difficult to distinguish in a drill core between gray slate and fine-grained dike material.

A vertical drill-hole is shown in Fig. 6, from the Marquette range. It was sunk 800 ft. in the Negaunee basin and then abandoned when 100 ft. more would have reached a good-sized orebody concentrated in a fold of the foot-wall slates. The hole was abandoned because it had been expensive, costing $4000, and because a slaty phase of the ore formation was cut at 800 ft., which looked similar to foot-wall material, but in reality was not. The deep, soft orebodies of the Negaunee basin, accounted by J. R. Finlay to be the greatest ore reserve in Michigan, lay unknown for years under a flat, drift-covered surface, until George Maas and others set up diamond drills in the fields around the city of Negaunee and drilled deeper than previous underground work had gone.

Fig. 7, from the Iron River district, shows the effort of a company which drilled one short hole in black slate, found no ore, and threw up its option. Later another company, more courageous, penetrated the slate and found ore. The geological occurrence in the Iron River field is somewhat different from that in the older, better known Michigan districts, because the ore occurs in irregular, discontinuous lenses in the Michigamme slate. This was for a long time confusing to mining men, because they were accustomed to see slate only in the foot wall. Many of the early companies in the Iron River field were too easily discouraged and abandoned explorations that later operators developed into large mines.

Fig. 8 is from the Menominee range. It is the plan of a mine level where a crosscut was driven 200 ft. into the wall for the purpose of finding any possible lense of ore parallel to the main deposit. Nothing was encountered at first, and the crosscut was stopped; later a more careful examination of the sides of the crosscut disclosed a thin seam of ore. Upon following this up, the orebody shown in the sketch was developed. One of the peculiarities of the Old Menominee range around Iron Mountain is the fact that occasional parallel lenses of ore are found back in the walls of the main ore zone; this fact has accounted for the continued life of some of the older

mines that were supposed to be worked out years ago.

Applied Geology, Audacity and Pure Luck Have Led to Discoveries

As in all mining regions, discoveries of valuable orebodies have been made as much by luck and accident as by well-advised exploration. The big Mastodon "find" recently made by the Longyear interests in the Crystal Falls district was a triumph of skilful applied geology, but the discovery of the equally large Maas mine orebody at Negaunee a few years ago by George Maas was more in the line of luck. The story goes that Maas was in possession of an old sketch map of the Marquette district which had been made by a German who visited there at one time; printed on the map in German over the present location of the Maas mine was the remark that "here is a good place to look for iron ore."

Mining men laughed at the idea of there being ore under the flat fields where Maas began drilling, but in a short time a huge orebody of 10,000,000 tons was proved up. Other explorations by Maas at the Negaunee mine and in the extensive territory west of the American mine were considered daring ventures, but either through luck or from some other quality the results were successful and large orebodies were found.

Some of the recent discoveries of ore in the Iron River field were cases of pure accident. Many of the original settlers were Scandinavian farmers who threshed out a living on 40 or 80 acres of land. When iron ore began to be discovered in the district every farmer for miles around maintained that his land had ore on it, and several of them hung around the mining offices until some company agreed to put a hole down just for a chance.

To everyone's surprise, three or four of these chance holes struck ore, and the known ore horizons were considerably increased. Somewhat different were the explorations of W. H. Selden, of Stambaugh, who has turned over several well started ore discoveries to mining companies. Mr. Selden had lived in the mining district for some time and had been a close observer of developments; he carefully calculated the trend of the ore zones and sunk exploratory shafts, eventually proving the extension of ore west and north of the Hiawatha mine.

❋

Strontium in California and Arizona

Celestite, strontium sulphate, is the mineral from which the various strontium compounds used in the arts are made. Strontium iodide, bromide, acetate, lactate and other salts are used in medicine and in the chemical laboratory, according to the U. S. Geological Survey (Bull. 540-T). Strontium hydrate is coming into use in the recovery of sugar from beet molasses. Strontium nitrate is the compound usually used to produce "red fire" in fireworks.

The celestite deposits in California occur along the northeast margin of the Avawatz Mountains in San Bernardino County, and are found in a belt 9 miles long and 1½ miles wide. The thickness of the bed is variable but may be as much as 75 to 80 ft. It is not pure but is mixed with gypsum, quartz, clay and iron and manganese oxides and possibly other substances.

Arizona celestite deposits are south of Gila Bend, Maricopa County. They occur as beds over- or underlaid in some places by sandstone beds and in others by igneous flows. In the northwestern part of the deposit the bed with which the celestite is associated is 40 to 50 ft. thick. The upper 8 or 10 ft. is the purest part of the deposit as known at present.

❋

Tonopah Extension Mining Co.

The report of the Tonopah Extension Mining Co., for the year ended Mar. 31, 1912, shows that there was no increase in the acreage of mining property owned by the company during the year. The total area at the present time amounts to 256.7 acres. During the year there were mined 54,618 tons of ore, all of which was treated at the mill. The total silver and gold content of this ore was 957,674 oz. of silver and 9758.5 oz. gold, or an average of 17.534 oz. silver and 0.179 oz. gold per ton, showing an increase of 0.86 oz. in silver and 0.002 oz. in gold per ton over last year. The average price received for silver was $0.61448 per oz., making the average of the ore mined and milled, $14.46 per ton.

The total profits earned during the year amounted to $236,293, after writing off $17,242 for depreciation upon machinery and building, and expending $41,205 for sinking a new shaft, the cost of which was charged to mining expense. Out of this profit, the sum of $94,339 was paid in dividends to stockholders, the fixed asset accounts were increased by $1980 and the balance, amounting to $139,972, remains in the treasury of the company, or in its current assets, principally in the form of interest-bearing securities.

In the mine there were 4296 ft. of drifting performed, 2198 ft. of raises and 3738 ft. of crosscuts, in addition to 940 ft. of shaft sinking, making a total of 11,172 ft. of development during the year. The new shaft was sunk to a depth of 952 ft. and three levels established from it. On the first, or so called 750-ft. level, there is a drift running east which will be connected with the 660-ft. level from the old shaft by means of a raise.

The mining cost, including all development work, was $5.331 per ton. Milling costs were $3.29 per ton, and the metal losses in milling, $0.964 per ton, while marketing bullion amounted to $0.233 per ton, a total expense and loss in tailing of $9.818 per ton, which subtracted from the gross value per ton of the ore milled, $14.469, leaves a profit per ton of $4.651. Extraction was 93.33% of the silver contained in the ore. The mill operated 97.41% of the available time during the year. Average fineness of the bullion produced was 945.104 in silver and 9.760 in gold. An accurate estimate of ore in reserve is not considered possible, but, basing expectations on present ore exposure and the past record of production, it is believed to be safe to assume that 150,000 tons of ore will be produced from the present area under development.

❋

Record Coke Production in Pennsylvania

Pennsylvania, the greatest coke-producing state, manufactured 27,372,018 short tons in 1912. This production is a record for the state and is more than was produced by all other states combined, according to the U. S. Geological Survey.

DETAILS OF PRACTICAL MINING

Drilling in Mid Air

By C. M. Hansen*

At the Bullwhacker Copper Co.'s properties in Butte, Mont., a great deal of glory-hole mining has to be done which would be extremely difficult, perhaps impossible, with a piston drill. Much of the drilling is done in positions almost inaccessible, without even opportunity for a foothold. However, by means of a Jackhamer drill, the miner is able to make good progress with comparatively little difficulty. Even an ordinary plugger drill

Drilling in Bullwhacker Open Pit

would be extremely troublesome for this work on account of the difficulty of rotating in cramped quarters.

In many cases the operator works sitting on a wooden seat in a rope sling let down over the side of the cliff, and the accompanying illustration shows the method of drilling a particularly difficult hole where a ladder had to be pressed into service. Here the operator has one foot on the ladder and is braced against it. There was just sufficient footing for the left foot on a projection of the rock.

One can get an idea of the dangerous nature of work of this sort when it is considered that it is 75 ft. from the operator's position to the bottom of the cut, where the broken ore is mucked into the cars and hoisted on an incline to the surface. Ore running about 4% copper is mined, the vein matter averaging about 125 ft. in width at the place where the photograph was taken.

Great speed is made in drilling the oxidized granite, about 1 ft. per min. Three-foot starters are used, followed with the 6-ft. steels, the holes being drilled to take 1¼-in. powder. During April enough ground was broken with one drill to ship about 1600 tons.

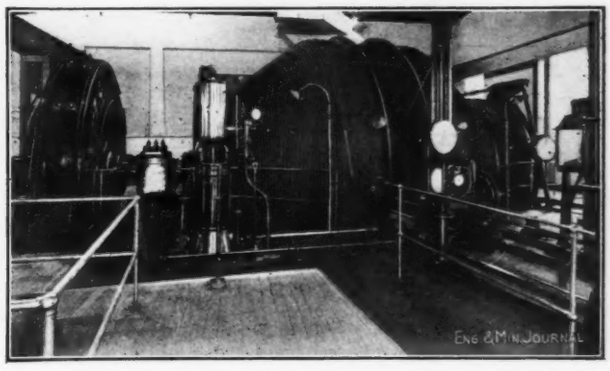
*Butte, Mont.

Efficiencies of Two Rand Electric Hoists

By J. N. Bulkley*

The efficiency of electric hoists in actual practice is always a matter of interest. That of the Hecla hoist in the Cœur d'Alene was recently calculated at 41%[1]. This figure seems low, since here on the Rand better results are being obtained. Two examples may be cited of electric hoists with which no equalizer is used.

The hoist of the Cinderella Deep shaft has cylindro-conical drums, with diameters increasing from 10 to 20 ft. It handles a net rock-load of 10,000 lb. in a 6500-lb. skip from a maximum depth of 4170 ft., with a 1⅜-in. rope weighing 3 lb. per ft. The hoist motor was rated



Cinderella Consolidated Five-Ton Hoist

at 1180 hp., and 55 r.p.m. The design was for a maximum rope speed of 3516 ft. per min., and the time to be occupied by a trip was calculated at 110 sec. with 30 sec. for loading. For reasons unconnected with the hoist, only 66% of the designed speed was attained.

The hoist had to handle part of the shift and material. It was in service during October, 1912, for 744 hr., so that the motor-generator was always running. During this time the power consumption was 131,130 kw.-hr., as registered by meter. As indicated by the graphic recording watt-hour meter, 115 hr. was consumed in hand-

*Consulting electrical engineer, General Mining & Finance Corporation, Ltd., Johannesburg, South Africa.

[1]"Eng. & Min. Journ.," Mar. 29, 1913, p. 658. "Electric vs. Compressed-Air Hoists," by K. A. Pauly.

ling men and material and the approximate energy consumption for this service as found by various tests was 5350 kw.-hr. The number of man-trips was 840 with 30 men on the two-deck cage and the number of material trips was 170.

The rock tonnage hoisted was 21,890, the number of trips was 4431, so that the net load per skip was 9880 lb. Of the whole number of skip loads, 4278 came from the maximum depth of 4170 ft., five from a depth of 3690 ft. and 148 from a depth of 3070 ft. This work production calculated to foot-pounds and converted to kilowatt-hours gives 68,260 kw.-hr. of useful work done in the shaft. The work per trip was therefore 15.4 kw.-hr.

USEFUL WORK OF MEYER & CHARLTON INCLINED SHAFT HOIST

Vertical Depth in Feet	No. of Skips	Tonnage	Useful Work Done in hp. hr.
340	50	225	66.2
560	88	396	24
630	11	50	31
704	120	540	384
900	57	256	233
1100	42	189	210
1175	648	2,918	3,465
1270	541	2,435	3,130
1437	521	2,346	3,405
1535	1333	6,002	9,300
1437	8	36	52
1437	89	400	581
Total	3508	15,793	21,081.2

Deducting the time consumed in man and material service the time occupied in rock hoisting was 629 hr., and in the same way the power consumption was 125,780 kw.-hr. The average duration of a trip as indicated by tachograph was 165 sec. Hence the whole number of rock trips occupied 203 hr. of actual running time, and for 426 hr. the motor-generator ran light. The energy consumption while running light was 49 kw.-hr. per hr., including excitation of hoist motor. Hence the wasted energy was 20,874 kw.-hr. Deducting this loss, the actual energy consumption in rock hoisting was 104,906 kilowatt-hours.

The number of rock trips made per hour was 4431 divided by 629, or 7.05; the hoist was designed for 25.7 trips per hour; hence the load factor was only 27.5%. The efficiency, including losses when the motor-generator was running light, was 68,260 kw.-hr. output, divided by 125,780 kw.-hr. input, or 54.2%. With a 100% load factor, which would eliminate the motor-generator losses while running light, the efficiency would be 68,260 kw.-hr., divided by 104,906, or 65%. Since the copper losses of the hoist motor and generator are the principal losses, it is safe to say that the overall efficiency of the plant would be still further increased; if the duration of a trip were reduced to the calculated figure of 110 seconds.

The incline shaft of the Meyer & Charlton Gold Mining Co., Ltd., has a dip of 42° 28′ for 746 ft. from the collar, of 33° 47′ for the next 360 ft., of 34° 50′ for the next 385 ft., of 32° 43′ for the next 171 ft. and of 27° 10′ to the boundary. The hoist is of the Ward-Leonard type, has drums, 3 ft. 8 in. by 10 ft., hoists an average net rock load of 9000 lb., though designed for 10,000 lb., in a 7000-lb. skip with a 1⅛-in. rope weighing 2.55 lb. per ft. The maximum rope speed is 2000 ft. per min. The man cages run at 1000 ft. per min. and carry 30 men. The hoist motor is rated at 452 hp. and 64 r.p.m. During August, 1912, the total energy consumption was 33,900 kw.-hr. During this period, 1020 man trips were made and 108 material trips and 15,793 tons were hoisted, while 900 short trips were made in the changing levels. The average hoisting depth was about 1320 ft. The distribution of the tonnage by levels is shown in the table.

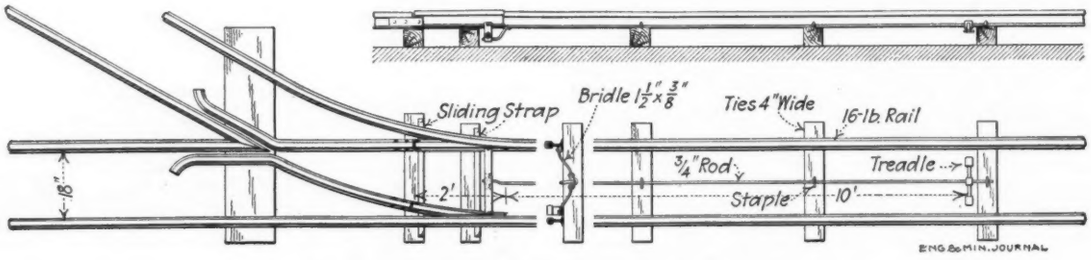
Calculated on the basis of the total energy input for all service and the useful work done, the efficiency is obtained by multiplying 21,081 by 0.746, and dividing by 33,900. It comes out 46.5%. The efficiency of the hoist, while engaged in handling rock only, would, of course, be much higher.

[Though not specifically stated, the Cinderella hoist was apparently also of the Ward-Leonard type. The Hecla hoist had a flywheel equalizer.—EDITOR.]

Treadle-Operated Switch

BY A. H. BROMLY*

The accompanying drawing shows a switch which can be operated by the trammer as he passes with his car and before the car reaches the switch itself. As shown, it is applied to a track with 18-in. gage, the switch points being 24 in. long. The fish plates fastening the points to the fixed rails have only one bolt through the points and are left loose on the point end to permit the necessary play. The bridle connecting the two points is bolted to the flanges and bent downward as seen in the cross-section. A small strap is riveted to the bottom of this so as to form a bearing for the end of a ¾-in. round rod. This rod lies between the rails for about 10 ft. and is held to the ties by staples so as to make a series of bearings. The end which operates in the bridle of the switch points is bent down so as to form a crank end. The other end is rigidly connected to a two-winged treadle lying between the rails, as shown. The trammer steps on the proper wing of this treadle as he approaches the switch and the latter is thrown as desired. The car will take the same side of the switch as the side of the treadle on which the trammer steps. The points should be provided with iron straps to slide upon.



SEMIAUTOMATIC SWITCH FOR MINE TRACK

*Mining engineer, Apartado 232, Mexico, D. F. Mexico.

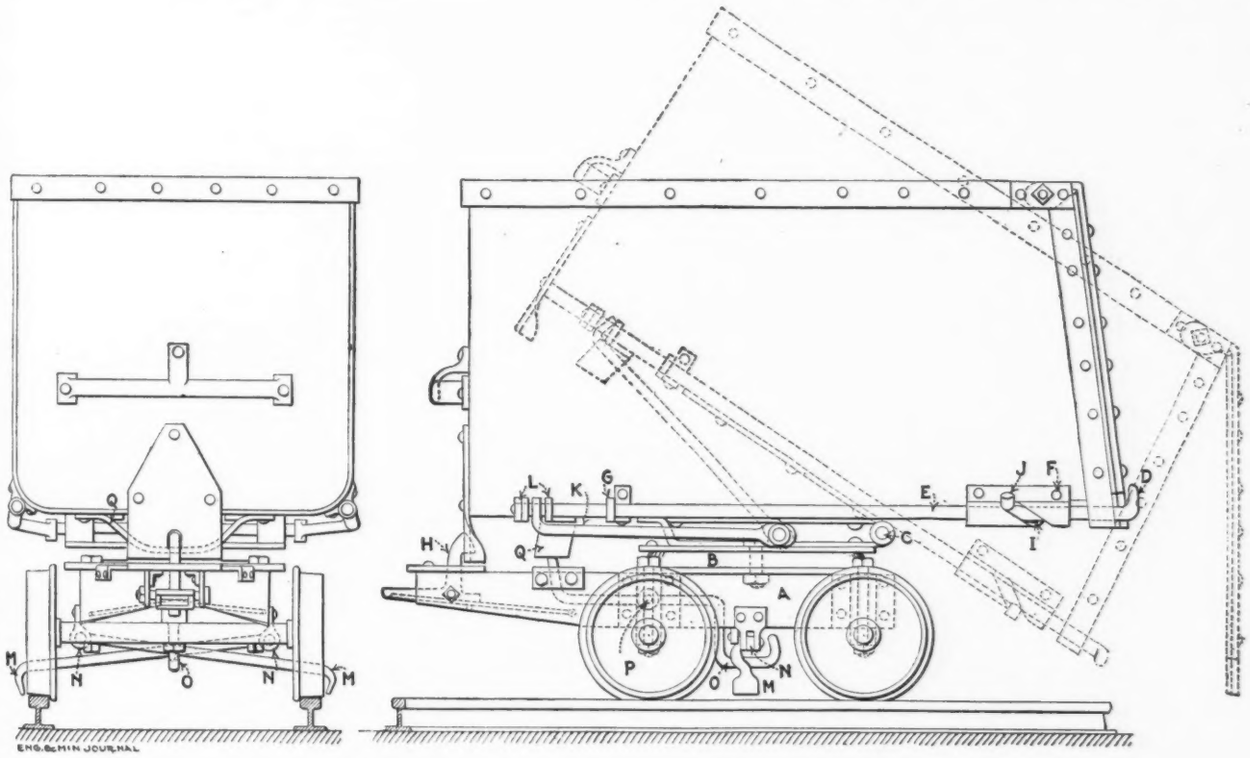
Automatic Car-Door Lock and Rail Grip

Mechanisms recently devised by George E. Truax (U. S. pat. 1,055,575) for turntable-dump ore cars, are designed to lock and release the car door automatically by the dumping of the car and to grip the rails in the same automatic manner, in order to prevent the car from overturning.

As seen by the illustrations, the car consists of the usual bed *A*, with a turntable device *B*, a dumping hinge *C*, and a rear foot latch *H*. The door is held against the front of the car by the hooks *D*, as shown in Fig. 1, on the ends of the rods *E*. These rods, one on each side, can slide back and forth and also rotate in the bearings *FG*, fastened to the car body. The bearings *F* carry spiral slots *I* in which move the studs *J*, fastened to the rods *E*. Evidently if the rods are thrust forward, they must rotate through the action of these studs.

Pivoted at about the center of the turntable are the pitmen *K*. These at their upper ends are turned in and form loose collars around *E*, acting between the fixed collars *L*. Since the car body is pivoted forward of the pitmen pivots, when the latch *H* is released and the car lifted, the pitmen tend to force rods *E* forward and thus rotate them; by this rotation, the hooks *D* are released from the door of the car and the door allowed to swing open, as shown dotted. The locking of the door by the hooks proceeds in the same automatic manner with the lowering of the car.

The car is also made to grip the tracks by means of the hooks *M*. These hooks are on the ends of rods hinged to opposite sides of the car bed, as seen at *N*. Their position is controlled by the bent lever *O*. This lever is pivoted at *P* and its upper end is depressed by the bracket *Q*, when the car is not dumping. The lower end of *O* at such times, lifts the gripping hooks *M* so that they are clear of the rails. When the car is lifted to dump, the hooks *M* are allowed to drop and fall under the heads of the rails, thus holding the car bed against any force tending to lift it from the track.



Automatic Lock for Car Door and to Grip Rails

Products of Explosion

A series of experiments was undertaken by the U. S. Bureau of Mines to determine the amount and nature of the products of blasting explosions and to devise means for the abatement of the poisonous gases formed (*Bull.* 48). The Bichel pressure gage was used for collecting the products. The gases considered poisonous are CO and H_2S. As will be seen by inspecting the table, the gelatin dynamite generated the least of these, but is, nevertheless, far from satisfactory. The formulas for gelatin dynamites seem to provide sufficient oxygen in the sodium nitrate to oxidize completely the combustible materials and are thus said to be well balanced. The sulphur used, however, forms hydrogen sulphide and it also appears that the paraffin-coated paper wrappers have not been given sufficient consideration as combustible material. A formula was devised which decreased slightly the combustible material and increased the sodium nitrate so as to accomplish complete oxidation of the paper and also of the hydrogen sulphide. Gelatin dynamite made on this formula was tested in the same way and evolved no CO or H_2S whatever, as shown in the table.

Further tests, using large quantities under actual

mining conditions were conducted, one in a limestone mine at West Winfield, Penn., and one in a zinc mine at Franklin Furnace, N. J. Results of this latter test are also shown in the table, giving the percentages of gases found in typical cases in the air near the blast immediately after its occurrence. No CO or H_2S were found after the explosion of the special gelatin, although an odor of H_2S was noted, and it is possible that some was formed and then decomposed before analysis. It should be noted that complete detonation was obtained in every case. It is concluded that gelatin dynamites should be made with an excess of oxygen, in order to eliminate poisonous gases, but if chemical or physical changes take place in an explosive before use, proper conditions do not exist for such elimination, and if the explosive is so old as materially to have lost its sensitiveness or is frozen or is set off with too weak a detonator, the amount of poisonous gas evolved is increased.

It is well recognized that an explosive burned slowly evolves a large quantity of poisonous gases and justifies its eloquent name of "stinker." A test was made with the pressure gage on some 40% ordinary gelatin dynamite so burned, and results were obtained as shown in the table. In addition to the high amount of CO evolved, there was 11.9% of nitrogen oxides.

In order to neutralize or prevent the formation of poisonous gases, there have been proposed several compounds for use in conjunction with blasting explosives. These consist largely of oxygen-carrying salts, alkaline carbonates, camphor gum, etc. Such compounds often mislead a miner by means of the pleasant aromatic odor they generate, while in reality they probably do not overcome the poisons at all. Tests were made to determine the effect of one of these compounds, which analyzed as follows: Moisture, 4.01%; camphor gum, 9.33%; $NaHCO_3$, 14.62%; NaCl, 9.3%; $(NH_4)_2CO_3$, 42.88%; $CaCO_3$, 19.86%. In the tests, various amounts were mixed with a charge of 40% straight nitroglycerin dynamite. In the first of the two tests listed in the table, 7.2 grams of the compound were added, together with the 12.4-gram wrapper cut into bits. In the second, the procedure was the same except that 23.8 grams of the compound were added. The logical conclusions are that there is no neutralizing effect got by using these compounds, and that the wrapper adds to the percentage of CO formed so that the net result is to increase rather than overcome the poisonous elements in the products of explosion.

In practically all of these tests, the detonator used was a No. 6 electric, except in the case of the black powder.

RESULTS OF ANALYSES OF PRODUCTS OF COMBUSTION OF VARIOUS BLASTING COMPOUNDS

		Weight of Charge, Grams	Weight of Products of Combustion, Grams			Gaseous Products, Percentage by Volume							
			Gaseous	Solid	Liquid	CO_2	CO	O_2	H_2	CH_4	N_2	H_2S	NO_2	NO
Laboratory Tests	Straight nitroglycerin dynamite, 30%	200	96.8	102.1	12.9	22.9	28.4	0.0	20.6	0.7	27.4	....	....	....
	Straight nitroglycerin dynamite, 40%	200	107.4	87.1	12.4	27.3	26.9	0.0	18.0	0.4	27.4	....	....	....
	Straight nitroglycerin dynamite, 50%	200	124.6	70.3	14.7	24.4	31.2	0.0	20.7	0.7	23.0	....	....	....
	Straight nitroglycerin dynamite, 60%	200	143.5	49.6	11.9	22.2	34.6	0.0	23.2	0.8	19.2	....	....	....
	Low-freezing dynamite, 60%	200	161.5	43.5	3.9	8.9	47.4	0.0	31.0	0.6	12.1	....	....	....
	Ammonia dynamite, 40%	200	95.7	85.9	26.1	41.4	3.8	0.0	3.1	0.8	45.5	5.4	....	....
	Gelatin dynamite, 40%	200	96.3	96.3	11.7	50.8	3.0	0.0	1.8	0.8	39.5	4.1	....	....
	Granulated nitroglycerin powder, 5%	200	115.5	93.6	8.3	51.3	2.7	0.0	0.9	0.7	28.7	15.7	....	....
	Black blasting powder, FFF	300	154.4	126.9	4.1	49.7	16.8	0.0	1.8	0.6	28.4	8.7	....	....
	Special gelatin dynamite, 40%	200	85.5	102.3	13.2	51.0	0.0	0.9	0.0	0.7	47.4	0.0	....	....
	Gelatin dynamite, 40%, burned	54.5	.....	.....	.....	19.4	13.7	3.0	0.4	1.4	53.2	....	0.6	11.3
	Straight nitroglycerin dynamite and neutralizing compound	219.6	111.1	.....	.....	25.6	28.2	0.0	18.9	0.5	26.8	....	....	....
		236.2	124.0	.....	.....	20.7	31.5	0.0	25.0	0.7	22.1	....	....	....
							Percentage of Gases in Mine Atmosphere							
Mine Tests	Special gelatin dynamite, 40%	14,500	Sample taken two minutes after firing blast, four feet from face, five feet from bottom.			1.25	0.00	20.3	0.0	0.0	78.5	0.0	....	....
	Ammonia dynamite, 40%	11,600				0.65	0.05	20.5	0.0	0.0	78.8	0.0	....	....
	Straight nitroglycerin dynamite, 40%	11,300				1.76	0.11	20.2	0.4	0.0	77.9	0.0	....	....

Mucking in a Flat Vein

The consolidation of seven properties to form the Crown Mines, Ltd., on the Rand, was followed by a centralization of operations and the installation of a comprehensive scheme of development and working. The difficulty of handling the ore in the stopes, says R. C. Warriner (*Journ.* South African Inst. of Eng., April, 1913) was met by developing a system of small, 55° chutes in the country rock, the general scheme of which is evident from the accompanying cross-section. The vein is thus split up into sublevel sections, tributary to the chutes, so that the maximum distance that the ore has to be shoveled in the stope is about 100 ft. The tramming to the chutes is done in 20-cu.ft. cars, which are dumped in tipples, the low height and rigidity of such cars being a great advantage. The tipples are end-dumping except where the chute comes directly into the stope, when the side-dumping type is used.

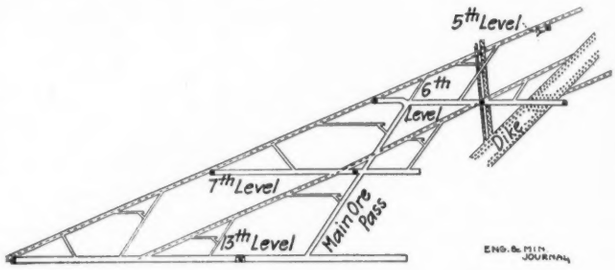


DIAGRAM OF TYPICAL DEVELOPMENT SYSTEM, CROWN MINES

To a foreign observer, the system would seem to entail a tremendous expense in dead work (even the advantage of prospecting not being present), as compared with gravity planes, small hoists or shaking chutes. It is stated, however, that in the scheme of advance development on a large scale, blocks were laid out of such dimensions on the strike as to reduce the cost to a negligible figure, the cost of the chutes and the accompanying crosscuts working out at from 2c. to 3c. per ton developed, and no maintenance charges being necessary.

The fact that the ore must be shoveled down the stope an average of 50 ft. is a great disadvantage from the American standpoint, and would probably prove a prohibitive expense in view of our high-priced labor. With a supply of sturdy, amenable, cheap native labor to draw on, however, conditions might easily be reversed. The use of self-acting gravity planes seems never to have received sufficient attention in South Africa.

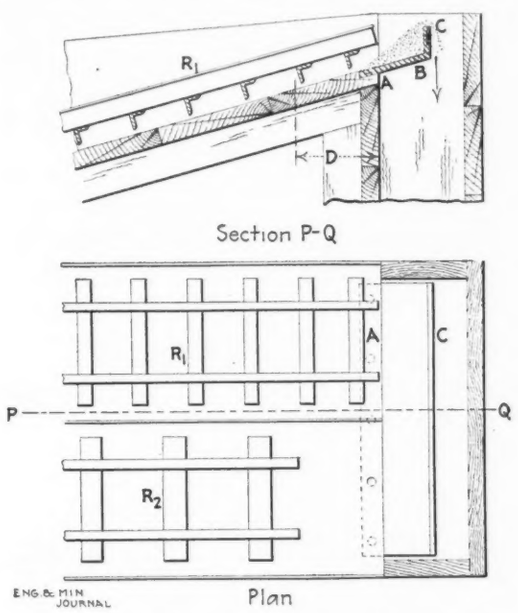
DETAILS OF METALLURGICAL PRACTICE

Regulating Moisture in Sand Discharged by Dorr Classifier

M. G. F. Söhnlein*

If thin pulp is fed to a Dorr classifier, the sand discharged often contains an objectionable amount of moisture. This can be remedied by a simple arrangement shown in the accompanying sketch, in which the rake R is at the end of its upward stroke.

A ⅛-in. iron plate, which has the same width as the classifier, is bent into the shape $A\ B\ C$ and bolted to the bottom at the discharge end. The sand is piled up in $A\ B\ C$ and loses much water, before it is discharged



Moisture Regulator on Dorr Classifier

over the lip $B\ C$. Every time the rakes bring some wet sand up to A, an equal amount of dryer sand leaves the classifier at C. I have made $A\ B = 5$ in. and $B\ C = 2$ in., but these measurements have to be varied according to the quantity of sand and the desired degree of moisture. By using this appliance the amount of water in sands could be reduced from 60% to only 12%. I conceived the idea by watching a classifier work when a bank of frozen pulp had been formed at the discharge end, which had almost the same effect as the lip.

[The Dorr classifier, when required, is equipped with a device for accomplishing the same result. At the end of the rake travel, for any convenient distance D, in the drawing, a filter bottom is inserted, which may be connected with vacuum or not, as required. The rake-travel bed may be made longer to allow for this installation if necessary.—Editor.]

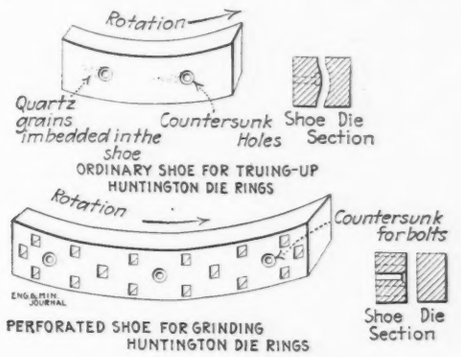
*Cia. Minera de Oruro, Machacamarca, Bolivia.

Huntington Mills and Their Operation

By Claude T. Rice

The great trouble with Huntington mills is their high cost of upkeep, and the large amount of watching they usually require to keep them in good condition. The cost of upkeep and repairs on Huntington mills is directly dependent upon the condition in which they are maintained. If mullers are allowed to become rough and flat, as the die rings are uneven, then pounding is sure to result, and the mill racks itself to death. Most of these troubles appear to be due to the fact that the mills are either over or underfed. Of course, the latter is the more desirable condition viewed from the standpoint of cost of upkeep, but no millman willingly lets that condition prevail on account of the decreased capacity, and its effect upon the total cost of milling.

The cause of the over and under feeding can be traced directly to the prevalent practice of feeding a thin pulp to the mills instead of a dewatered product and adding the required amounts of water below the mills. Most Huntington mills are treating an oversize product, com-



Huntington Mill Shoes

ing from rolls, that has first been sent to jigs or coarse tables to remove as much of the free mineral as possible before it is ground finer. As a result the consistency of the pulp varies as well as the amount and so it is impossible to keep a regular load on the Huntingtons without giving them an undue amount of attention. But if the product from the concentrators is dewatered, as it would be, were it being sent to rolls, and if this dewatered product is stored in front of the Huntington mills in a bin fitted with automatic feeders, say of the plunger type, all trouble from over or under feeding is done away with, as a regular and constant feed can thus be maintained. This is the practice at the Silver King mill, at Park City, Utah, where it is probable that Huntingtons are run at less cost of upkeep than at any other mill in the country.

Even if the Huntington mills are fed regularly, the dies and mullers will wear unevenly, but fortunately the mullers get flat mainly on account of the die rings

wearing unevenly. Consequently the problem is to keep the die rings true. Shoes are sent out with Huntington mills as they come from the factory, but they are seldom used to true up the die ring, as they greatly decrease the capacity of the mill. These shoes are cast-iron segments of a circle having the inner diameter of the die ring, bolted to a yoke similar to the one that carries the muller. This shoe, as it goes around in the mill, tends to wear down the high places in the die ring. Unfortunately it grinds slowly, and if there is much quartz in the pulp, the die wears unevenly from top to bottom, quartz accumulates in the places where the shoe is countersunk to receive the bolts, and wears the die faster than the metal of the shoe. The shoe itself, therefore, requires frequent truing up, or new irregularities will appear while the older ones are being removed. The capacity is thus decreased in the mill, as the muller does not come entirely in contact with the die throughout the whole of its face.

This drawback in the ordinary shoe has been overcome by J. W. Thompson, superintendent at the Silver King mill, by having soft cast-iron shoes made with holes scattered regularly over the surface for the quartz grains to accumulate in. The quartz grains then train back from the holes and become imbedded in the soft cast-iron of the face, so that soon the whole surface is made up of a number of sharp quartz grains imbedded in the cast iron.

As the grains are evenly scattered, both laterally and vertically, over the surface of the shoe, the wear on the ring is even, and owing to the fact that the quartz grains cut faster than does the ordinary cast-iron shoe, the shoe does not have to be in the mill as long a period as the old-style ones. In order to concentrate the wear as much as possible on the high places in the die ring, the shoe is made longer than in the case of the ordinary shoe, and on that account, too, the wear is faster than if an ordinary shoe were used. Such shoes are kept ready on a yoke, and as soon as any tendency toward chattering is noticed in the mill a muller is taken off and a shoe and yoke put on in its place. As the die rings are kept smooth, there is no reason for the mullers to pound and they wear evenly. As the mullers do not pound, bolts do not work loose, and breakages from that cause do not result. Therefore, the mills in the main need merely inspection, and no large repair crew is required to keep them in operation.

Experience has shown that the perforated shoe wears approximately twice as fast as the old form, when once the shoe has become embedded with quartz particles. The wear is mainly on the quartz, which renews itself from time to time.

The Basic-Lined Copper Converter

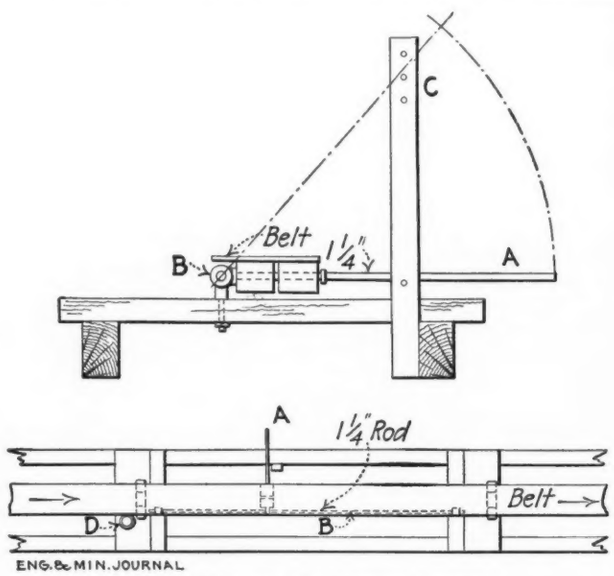
Writing in the June "Bulletin of the American Institute of Mining Engineers," E. P. Mathewson outlines the history of the adoption and development of the basic-lined converter, as applied to copper bessemerizing. He states that practically all the bessemerizing of copper matte in the United States today is done in basic-lined converters. The main points to be observed for successful operations are: Not to exceed a temperature of 2100° F.; not to have tuyeres smaller than 1¼ in., 1½ in. being the preferred size; to drive in punch rods the full size of the tuyere opening immediately after pouring copper; to maintain in the converter as large a mass of matte and slag as possible, in order to prevent sudden changes in temperature and overheating of the lining; and to employ a slag containing preferably about 25% of silica.

A test made with a view to finding out whether the cutting action of converter slag on a magnesia brick lining bore any relation to the silica content of the slag was made, 13 slags being selected from daily samples sent to the laboratory and analyzed for silica and magnesia. The result showed no relation whatever between silica and magnesia content.

The basic-lined process shows the following advantages: Decreased cost of lining; ability to use large units with resulting economies in labor, power and repairs; neatness and cleanliness of plant with consequent abolishment of danger to the health of the lining crew, arising from dust.

Side Tip for Conveyor Belt

The accompanying sketch shows a simple and effective side tip for a 14-in. conveyor belt, devised by W. J. Nichol, Lord Nelson Co., St. Arnaud, Victoria (*Min. and Eng. Rev.*, May, 1913). As at present arranged the ore from a rock-breaker is delivered by the belt at three points, two of the points being fitted up for side delivery, as in the sketches, and the other point is over the end pulley.



SIDE TIP FOR CONVEYOR BELTS

When the side tip is in operation the lever *A* is raised and held at an angle by a pin at *C;* when the lever is in its lowest position the ore on the belt is carried past the tip. With this arrangement the wear and tear and strain on the belt is much less than with the usual mechanical distributor, and it is inexpensive to install, as the apparatus is merely a rearrangement of one set of three troughing pulleys, two of them being used as carriers on the lever *A*, and the third one as a guide pulley running on a vertical spindle, as shown at *D*.

Simple Contact Electric Connections Will Have Less Resistance if a little oil is introduced in them. This finds application in the electrode connections in electrolytic copper refining.

THE COST OF DOING THINGS

Effect of Centralization on Costs

An interesting analysis of the effect on costs of various changes in mining operations is given by R. C. Warriner in an article describing the Crown Mines, Ltd., "Journ. South African Inst. of Eng.," April, 1913). The company was formed to include some seven adjacent properties on the Rand and radical changes in operations were made, extending from the underground workings to the mill. It was expected that these would result in material savings. Apparently a slight increase in costs per ton took place. Two months, June, 1909, and January, 1913, are examined, as representing the two different systems. The respective tonnages were 137,753 and 190,000, the costs per ton were $3.79 and $4.12. One explanation of the increased cost for the new system is that there had not elapsed sufficient time to get it working well or to feel the effect of improvements, nor was the tonnage yet up to a maximum.

In certain items, an absolute reduction of costs had been effected. Thus a consolidation of the surface workshops brought about a saving of 3.46c. per ton. Pumping costs were reduced from about $20,500 for the month to about $12,100, making a difference of 9.06c. per ton, considering the increased tonnage. In surface work, 7632 more tons were sorted and 37,874 transported, and an absolute reduction of $3700 effected. These surface savings per ton were 2.94c. on sorting and crushing, 2.90c. on transportation, 8.38c. on milling, 13.24c. on cyaniding. The total amount of these various savings was $0.40 per ton.

The following factors operated to increase the costs:

(1) There was a relative increase in development footage. The footage was increased from 2678 to 3798, and while based on equivalent tonnage, this would have represented an increase of 104 ft. only, the increased cost at $14.60 per ft. was 0.8c. per ton.

(2) There was an increase in sorting percentage from 9.846% to 12.874%; if this increase in discard had not been made, the corresponding increase in the tonnage milled would have made a saving of 13.8c. per ton.

(3) Native wages, recruiting fees and compound expenses increased, due to competition in recruiting between the various groups. This wage increase amounted to 6c. per shift worked and the other items to 7.5c. per shift worked. On the 190,000 tons, this amounted to 17.4c. per ton.

(4) The introduction of sand filling accounted for an increase of 3.2c. (5) Additional water service underground for spraying against dust, added 3.2c. (6) Miners' phthisis insurance made an increase of 1.4c. (7) Main-reef foot-wall mining was largely discontinued so that for the square units of reef broken, a smaller tonnage resulted. In other words, what amounted to a narrower vein, was mined. The increase in cost from this was considerable and while difficult to estimate, probably did not fall far short of 40c. per ton.

(8) The effects of the introduction of the eight-hour day are similarly difficult to calculate. It is put in at a 12c. increase.

The total of these items amounts to about $0.93 per ton. If the unavoidable changes in conditions, which caused the increases, had not occurred, the total saving by the new system would have been $1.13, which would have been accounted for, in addition to the items enumerated, by decrease in shaft maintenance and other economies difficult to analyze.

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Dome Mines

Abstracts from the second annual report of the Dome Mines Co., South Porcupine, Ont., Canada, for period Nov. 30, 1911, to Mar. 31, 1913, are given herewith. The gross proceeds from the ore treated amounted to $1,043,995. The working profit was $509,956, after deducting the following expenditures: $157,666 for mining, $214,788 for milling, $131,097 for general works expense, $5839 for selling and $24,649 for office and general expenses. A net profit of $371,228 is shown after writing off $138,728, consisting of $61,087 for development, $53,516 for general charges and $24,125 for fire loss. The company ended the period with $217,128 current assets and $272,267 current liabilities. Deferred charges carried on the books are: buildings and equipment, $1,008,963, and general development, $342,403. The net addition to the development account was $148,391, after deducting amount written off.

The Dome property consists of 240 acres situated in the southern part of Tisdale township. The orebody is a dome of quartz and outcrops on the surface for about 800 ft. and the width varies from 200 to 250 ft. In July, 1911, the company's half-erected mill was destroyed by the fire that burned most of the plants of the district. A mill of 10,000 tons monthly capacity has since been erected and milling operations were commenced on Mar. 23, 1912. During the period covered by the report 128,015 tons were mined, 25,179 tons of this were waste and 102,836 tons were ore. Openpits produced 93,581 tons of this ore and 9255 tons came from development work. Of the waste rock dumped 6266 tons came from sinking No. 2 shaft and the balance almost entirely from development. The development work performed consisted of 155 ft. of shaft sinking at No. 2, 866 ft. of raising, 1835 ft. of drifting, 2059 ft. of crosscutting, and 657 ft. of incline, total 5572 ft. The mill as erected comprises forty 1250-lb. stamps, four duplex Dorr classifiers, four 5x22-ft. tube mills, four Pachuca tanks, 8x40 ft., three 90x4-in. frames Merrill slime-filter presses, two 52-in. Merrill zinc-dust precipitation presses.

The mill has treated 101,812 tons of ore yielding $10.25 per ton or $1,043,994.93, of which 53.7% was recovered by amalgamation and 46.3% by cyanidation. The percentage of extraction is reported to be 95.63%. The refinery and assay office comprises a briquetting ma-

chine for gold slimes, small water-jacketed blast furnace, cupel furnace, retort for amalgam, and Monarch fusing furnace.

The assay office is equipped to handle about 150 determinations a day. The sampling department is fully equipped with crushers and grinders. Power has been changed from steam to electric, which is delivered from Wawaitin Falls, 13 miles distant, and costs are expected to be lowered as steam power has been excessive. The ore reserves above the 45-ft. level are estimated to contain 315,528 tons of ore running $7.53 per ton. In addition to this there are 250,000 tons developed below the 45-ft. level to the 100-ft. level, which on present knowledge cannot be valued. On the 100-ft. level there is 46,750 sq.ft. of ore not taken into account until further work is done. No credit is taken of ore reserves for much larger bodies of ore indicated by bore holes and development at the 260-ft. level from vertical shaft No. 2. The operating costs, exclusive of development, were as shown in the accompanying table:

OPERATING COSTS ONLY, DOME MINES

	Mining	Crushing	Milling	General	Total
	Per Ton Milled				
Labor	$0.54	$0.06	$0.25	....	$0.85
Supplies	0.17	0.01	0.33	....	0.51
Steam	0.09	0.01	0.01	....	0.11
Power	0.19	0.06	0.69	....	0.94
Water	....	....	0.15	....	0.15
Laboratory sampling	0.05	....	0.05	....	0.10
Repairs	0.16	0.10	0.32	....	0.58
Department works expense	0.11	....	0.31	....	0.42
Camps, hospitals, etc.	....	....	....	0.18	0.18
Insurance and taxes	....	....	....	0.09	0.09
Superintendence and general	....	....	....	1.02	1.02
Total	$1.31	$0.24	$2.11	$1.29	$4.95

The rock drills principally used for development are the Ingersoll-Rand No. 43 piston and the Rand Butterfly stoper drill for raises. In the pits the Rand BC No. 26 Butterfly hand hammer drill is used almost entirely, although a Rand No. 43 is used for drilling through overburden to rock for starting a new bench on the rim of the pit. No records were kept of efficiencies up to Dec. 31, 1912, so the following figures are for the last three months of the period covered by the report. Shifts are of 9 hr. length.

DRILLING AT THE DOME MINES

Linear development	Drifts and Crosscuts	Raises
Average machines, running foot	5.6	5.2
Footage drilled per machine shift	36	16.5
Footage advanced per machine shift	1.68	0.62
Stoping		
	Rand No. 43	Rand and Hammer
Average number of machines running	1.5	6.0
Holes drilled per machine shift	3.4	5.0
Footage drilled per machine shift	30	38.7
Tons broker per machine shift	43.7	
Tramming from boxes		
Average tons trammed per shift		272.8
Average number of trammers per shift		11.8
Average tons per man per shift		22.7
Tramming from development		
Average tons trammed per shift		43
Average number of trammers per shift		7.12
Average tons per man per shift		6.1

Buena Tierra Mining Co.

The report of the Buena Tierra Mining Co., Santa Eulalia, Chihuahua, Mex., for the year ended Dec. 31, 1912, states that 31,781 tons of ore were mined from which 1038 tons or 3.27% was sorted out on surface as waste. The shipments to the smelting plant, 30,085 tons, show a net return of 8.65 oz. silver and 15.1% lead. Operating costs at the mine were: Mining, $1.33 per ton; development, $1.08; general expenses, 54c.; taxes, 11c.; sorting and transportation, 86c.; total, $3.92 per ton. Including expense chargeable to ore shipped from stock, the total cost of ore to smelting works was $4 per ton shipped.

The Santa Eulalia district is included in a large area of well marked bedded limestone, which lies nearly horizontal, with a dip of 10° S. In the greater part of the district it is covered over with flows of andesite and rhyolite. Certain strata show abundant fossils. These strata are, apparently, more favorable to ore deposition; and almost all of the known orebodies of the district occur within these horizons. The limestone beds are remarkably free from folds, but are much fractured, and somewhat faulted by numerous belts of fissures nearly vertical, which extend for long distances. The ore-bearing solutions availed themselves of the fissures in the limestone as circulating channels, and spread out horizontally in more favorable strata, especially where the ground was much fractured by cross-fissures. Ore is not found continuously along these fissures, but usually in large blocks or masses at the junctions of fissures.

Approximate Costs of Concrete Construction

The costs given in this table, from Taylor and Thompson's "Concrete Costs," are the approximate costs of completed structures, based chiefly on published cost data. The total costs, including excavation, forms, steel, and miscellaneous work, are divided by the number of cubic yards, so that the costs as given are in terms of a cubic yard.

It is evident from the wide range in costs that the values can be used only for rough approximations. The costs include an allowance for superintendence, overhead charges and general expense, but do not include any allowance of home-office expenses and profit. Such a table as this, is useful when it is desirable to make rough preliminary estimates for the sake of deciding between different types of construction or in the case of contemplated work whose prosecution may depend on the expense involved.

RANGE AND AVERAGE OF COMPLETED CONCRETE STRUCTURES

	Cost per Cubic Yard	
	Range	Average
Mass foundations	$4.00 to $9.00	$7.00
Mass concrete as in a dam	6.00 to 9.00	7.50
Bridge piers and abutments	7.00 to 15.00	10.50
Arches, 30-ft. to 50-ft. span	5.00 to 17.00	9.50
Arches less than 30-ft. span, culverts	5.00 to 12.00	9.50
Girder bridges	7.00 to 18.00	12.50
Conduits, sewers, etc	5.00 to 16.00	9.50
Tunnel lining	6.00 to 42.00	15.00
Core and gravity retaining walls	6.00 to 8.00	7.00
Reinforced retaining walls	12.00 to 15.00	13.50
Reservoirs	6.00 to 23.00	10.50
Tanks	4.00 to 20.00	12.00
Whole buildings	8.00 to 26.00	14.00
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CORRESPONDENCE AND DISCUSSION

The Beatty-Guggenheim Case

In the JOURNAL of July 12, under the heading, "The Beatty-Guggenheim Case," is discussed the recent decision of Justice Gerard in the suit of Alfred Chester Beatty against the Guggenheim Exploration Co. and Oscar B. Perry.

I was Mr. Beatty's counsel in that case, and therefore am familiar with it. The JOURNAL article would give an erroneous impression—unfavorable to Mr. Beatty—to anyone not familiar with both sides of the controversy. Mr. Beatty is in Europe. I, therefore, deem it my duty to take this matter up with you.

This suit was not brought by the Guggenheim company but by Beatty against the Guggenheim company and Perry, to recover money and Yukon Gold Co. stock and options. Justice Gerard decided against Beatty. Beatty has appealed, but the appeal cannot be heard until next winter.

A. N. C. Treadgold had some mining claims and options on a large number of claims in the Yukon, for the most part lying contiguous to one another, and together making a single situation. He offered them to the Guggenheim company. After a meeting between Treadgold, John Hays Hammond, the general manager and consulting engineer of that company, and Beatty, assistant manager and assistant consulting engineer, Hammond sent Perry, a hydraulic-mining engineer, and a corps of Perry's assistants, to the Yukon to make an examination.

Perry promptly wired Hammond a highly favorable report from the Yukon, adding that Treadgold had to have money immediately. This money was needed to protect maturing options, the loss of which would cause the disintegration of the situation. Hammond wired Beatty, then in the West, to go to the Yukon. Beatty wired from the Yukon to Hammond, strongly recommending taking over the properties. Attention was again called to Treadgold's urgent need for immediate money. There was a delay in answering this telegram. In the meanwhile, it was absolutely necessary for Treadgold to have $15,000. Perry was exceedingly anxious that it should be put up, but he had no ready money. After a conference between Perry and Beatty, Beatty put it up out of his own funds. This money held the situation together and contributed much toward the Guggenheims making the large amount they subsequently made out of this situation. After six days' delay a telegram was received by Beatty and Perry from Hammond. This was answered, and then in a day or two, another telegram, which is the telegram referred to in your article, came. Whether or not this telegram, at that time, ended the Guggenheim company's connection with the matter, is immaterial in any view of this case; but let us see what Daniel Guggenheim, the president and head of the Guggenheim company, said that telegram was intended to mean. He testified:

(p. 653) When we sent that telegram I want to explain that Mr. Hammond and I agreed that it was advisable to send some telegram in order to turn the matter down at that time. But he said to me, "Mr. Guggenheim, even though we will turn it down now, those gentlemen will all come on to New York in the winter, when we will take the business up again and discuss it; the business will come to us."

Regardless of what this telegram was or was not intended to accomplish, at any rate it meant delay, but the situation could not wait. More money had to be put up. After a conference with Perry, Beatty again came to the rescue. Beatty agreed to advance $20,000 more which he subsequently did, in time to save the situation. If this money Beatty put up had been lost, the loss would have been his—not the company's.

In referring to a telegram to Beatty, sent previous to the one just referred to, you say: "On the strength of this he was authorized to expend $300,000 on *the purchase* of claims" and then later on, you say: "The court calls attention to the point that neither in this telegram nor any other put in evidence did the company withdraw its authorization to *spend $300,000 to protect the situation.*"

There was no authority to spend $300,000 or any other sum, loan or advance money "*to protect the situation.*" The only authority was to *purchase* claims up to $300,000 the title to which, this telegram said, must be taken in the name of the Guggenheim company, so that "our possession such claims will make strong our position in negotiations and is key to the situation." That was impossible. Treadgold had such control over the situation that it could not be done without his consent, and, of course, he would not consent to that. Beatty, answering this telegram, wired that it could not be done, but no suggestion came from New York about advancing or loaning Treadgold any money. The telegram just referred to reads:

In the meantime to protect situation we authorize you to purchase claims up to $300,000. Claims must be taken in our name and we must not be committed to further investment Treadgold. We take it our possession such claims will make strong our position in negotiations and is key to the situation.

After the subsequent telegram which Mr. Guggenheim testified was sent "to turn the matter down at that time," was received, the question arose as to Beatty—in view of his having advanced his own money and agreeing to advance more money—becoming personally interested. Beatty told Perry that while he would advance the money needed immediately, he had no right to become personally interested in this situation without Daniel Guggenheim's and Hammond's consent—that he believed they would consent, but if they did not, Perry would have to return this money to him, but if they did consent, he would become personally interested with Perry. That was agreed to.

Beatty and Perry then inspected other properties in which the Guggenheim company was interested up in that country, at some distance from the Yukon, and then Beatty returned to New York. Perry returned to the Yukon, where Treadgold had remained. After Perry furnished Treadgold with Beatty's money and a small

amount that some relatives of Perry's put up, Treadgold and Perry entered into negotiations with reference to the contract between themselves. Treadgold was unwilling to let anybody besides himself hold the title to any of the claims, and the contract finally entered into between him and Perry provided that if Treadgold sold certain of the claims within a fixed time, Perry should have his money back and a certain profit, but if he did not sell them, then Perry was to receive the title to those claims.

Two or three months later, Treadgold came to New York and reopened the negotiations with Hammond. About Dec. 5, 1905, a deal was finally consummated between Hammond and Treadgold by which the Guggenheim company took over the entire situation. The amount to be paid included the profit which Perry was to get under his contract with Treadgold, which amounted to about $45,000 cash and a small amount of stock. The Treadgold-Guggenheim transaction amounted to several million dollars.

Although Perry then had a contract with the Guggenheim company to which I will refer later on, Hammond, at the time he agreed to purchase the Treadgold properties, after consulting Daniel Guggenheim, made a new contract with Perry, then in New York, by which Perry, in consideration of releasing all claim against the Guggenheim company, and agreeing for two years to render any services he might be called upon to render in connection with these properties, was to receive 4% of the stock of the Yukon Gold Co. to be formed to take over the Treadgold situation, and an option on 4% of the stock at cost, and also 2% of the stock of the Northwest Hydraulic Co., another company to be formed to acquire properties in connection with the Treadgold properties, Perry, knowing that if Beatty had not put up his own funds, Perry on account of the contingent character of his existing contract, would not have gotten anything out of this situation, felt that Beatty was entitled to share in all he made. He agreed to give Beatty a part of his profit under the Perry-Treadgold contract, and of what he got under his contract with the Guggenheim company, but no part of his Northwest Hydraulic Co. stock.

Beatty testified that as soon as he returned to New York, he told Daniel Guggenheim and Hammond that he had put up his own money, and that it was agreed between him and Perry that if Guggenheim and Hammond did not object, Beatty should be interested with Perry in everything that came to him out of the transaction, and that they assented to it, except that it was later stipulated that Beatty should get none of Perry's Northwest Hydraulic stock.

Beatty and Hammond testified that Daniel Guggenheim and Hammond, realizing that the Guggenheim company owed Beatty a great deal on account of his having put up his own money to keep the situation together, which his contract with the company did not call on him to do, readily assented that Beatty should receive a share of everything Perry was to get out of this situation, except that Guggenheim did not want Perry to give Beatty any of his Northwest Hydraulic stock.

In 1904, Hammond made a contract with Perry to give him 5 to 7½% of any proposition that the Guggenheim company took over on his recommendation. In one finding the court finds that it was under this contract that Perry examined the Yukon properties in 1906. In another finding the court finds the contrary. Regardless of which of these two findings is correct, the fact is that the gross amount Perry got under his 1905 contract, including the part he was to give Beatty, was less than Hammond agreed in the 1904 contract to give him. Moreover, Justice Gerard specifically found that the amount given Perry under this contract, which included the part Beatty was to get, was reasonable and fair.

This all occurred in 1905. No Yukon stock was issued until 1908. All the cash, profits, stock and option which Perry was to get under any and all of the contracts, were actually delivered to him in 1908, but in April, 1908, Perry, acting under instructions of the Guggenheim company, refused to deliver Beatty the part thereof he had agreed Beatty should have. Then Beatty brought this suit against the Guggenheim company and Perry to compel Perry to perform his agreement.

Apart from all legal questions and technicalities, the question is, was Beatty "secretly" interested in Perry's profits and gains, or did Daniel Guggenheim and Hammond, the principal officers of the Guggenheim company, when they made the contracts with Perry and with Treadgold, in 1905, know that a part of what Perry was to receive under both contracts was to go to Beatty because he had put up his own money, thus making possible this deal which became so profitable to the Guggenheim company, and did they, with this knowledge, make these contracts, intending that Beatty should share therein. Or, in other words, did they at that time know that Beatty had a personal interest, and did they assent to his having such interest?

Justice Gerard found that although Hammond, who was Beatty's superior officer, knew about this, as a matter of law he did not have sufficient authority to make notice to him notice to the company. Justice Gerard found that Daniel Guggenheim did not know that Beatty was interested with Perry or in the properties.

Beatty offered the following letter from John H. Steele, then and now the general counsel for the Guggenheim company, but which the Judge in his final opinion decided he would not receive in evidence:

July 14, 1908.

A. Chester Beatty, Esq.,
Dear Mr. Beatty—

In compliance with your request and in order that, in case of anything happening to me or to Daniel Guggenheim, before he can make a reply to the questions on the memorandum you left with me this morning, you may have my recollection of our conversation with Daniel Guggenheim a few days ago, I desire to say that at that interview Daniel Guggenheim stated that, at the time the transaction for the Yukon properties was made with Perry, he knew that you were interested with Mr. Perry in the properties.

Faithfully yours,

JOHN N. STEELE.

John Hays Hammond, who was an entirely disinterested witness, testified:

(p. 461)

Q—Did you understand from what Mr. Beatty told you that he, Beatty was interested with Perry in the profits on this contract? A—Yes.

Q—And did you so inform Daniel Guggenheim? A—I told Daniel Guggenheim that Mr. Perry and Mr. Beatty were interested in the profits to be derived from whatever transaction took place out of the Yukon situation.

(p. 466)

Q—Now at the time you fixed this compensation of Perry, did you know from Mr. Beatty that he was to share in that compensation? A—I did.

Q—And did you tell Daniel Guggenheim so? A—I did.

Q—And did Daniel Guggenheim object to it? A—He did not.

(p. 460)

Q—Did you have conversations with Daniel Guggenheim about that? A—Yes, I did, stating, "I cannot remember the words of the conversation. I can only remember the fact that I did have a conversation with Daniel Guggenheim that Mr. Beatty was interested with Mr. Perry and why I am so absolutely confident on that point is because of the fact that when we finally came to settle with Perry, Daniel Guggenheim stipulated that Mr. Beatty should have no interest in what was called the Northwest Hydraulic Co.; that was subsequently specified, but in the other things it was agreed that he should be interested."

Defendant Oscar B. Perry, now consulting engineer and a director of the Guggenheim Exploration Co., testified:

(p. 249) Mr. Beatty, in my presence, made some remark to Mr. Hammond about his being interested in what this compensation was to be and Mr. Hammond at one time made a remark which indicated that he knew Mr. Beatty was interested, by saying to me, in Mr. Beatty's presence, something to the effect of not letting Mr. Beatty get away with too much of this, or something of that sort.

(p. 87)

Q—Did not Mr. Hammond say to you in his office at or about the time the contract was signed, that Daniel Guggenheim wished you to retain this entire 2% participation in the Hydraulic Co., and not give any of that to Mr. Beatty? A—Yes, he did say something of that kind, or practically to that effect.

Thomas W. Lawson, testified that at the time he and the Guggenheim's were negotiating with reference to Lawson's marketing the Yukon stock, he had the following conversation with Daniel Guggenheim:

(p. 252) . . . . and I made one of the foundation conditions of my attempting the sale of the stock that I know in advance what other stock was outstanding other than that which I was to attempt to sell, that I might know what I would have to deal with in the formation of my selling plans, and in a subsequent carrying of them out. (p. 266, cross-examination.)

Q—Now, who made use of the expression that Mr. Perry and Mr. Beatty were in partnership? A—The expression of partnership?

Q—Yes. A—I am not sure that the word partnership was used. That drives me back again. Daniel Guggenheim in answer to my quite urgent questions trying to pin the Beatty interest down in some form that we could deal with it in the formation of my plans for selling the stock, said to me that we could not, he could not deal with it as so many shares of stock, or a definite interest, because Mr. Perry and Mr. Beatty had been in together from the start and had a partnership, or a joint interest or an undivided interest, I don't know just what term or what word it was.

Q—Daniel Guggenheim used that expression on that occasion, you say? A—Yes.

The Court, in an extremely long opinion, did not quote from Daniel Guggenheim's testimony. Let us see whether, if he told arbitrators not bound by the rules prevailing in courts, what he told on the witness stand, they would not believe that he knew and assented to Beatty's being interested with Perry. As already stated, the contracts between the Guggenheim company and Treadgold and Perry were made in December, 1905.

(pp. 634-5)

A—Mr. Hammond told me something in 1906. I think the end of the year, that Mr. Beatty had advanced some money in order to hold certain options in the Klondike. That is the substance of everything that was said in reference to that matter.

Q—Did he say to whom he had advanced it? A—He said he had advanced the money to Mr. Perry. . . . .

Q—Did he, Hammond, at any time speak to you upon the subject of Mr. Perry's compensations from the Guggenheim Exploration Co. for his services in connection with the Yukon business and in which the name of Mr. Beatty was used in any form? A—No, he did not. He told me he said to me at one time, that Mr. Beatty wants to get some of the stock or wishes to get some of the stock that was allotted to Mr. Perry, and whether I would have any objection to his getting any of that stock. I told Hammond that I did not object, but he should be very careful and see that Mr. Beatty did not take too much of Mr. Perry's stock, and told him that I did not think Mr. Beatty needed a guardian, but I thought perhaps Perry did.

(pp. 667.8)

Q—Now, when you got back here in 1908, you testified yesterday, the question was asked by Mr. Marshall, "My recollection of that matter is that it was in your hands and Mr. Beatty and I did not discuss it." In those days, at that time, you were investigating it and finding out what the situation was and familiarizing us with it. A—We didn't know anything about it.

Q—Up to that time you didn't know that Mr. Beatty had any stock or claimed to have any stock in the Yukon, did you? A—Well, you know he was to get some stock that Mr. Hammond said he could take from Mr. Perry. He had that stock.

(p. 668)

Q—When did you find out that he claimed the right to have a part of Mr. Perry's 4% and a part of Mr. Perry's profits on the Perry-Treadgold situation? A—Those are two questions.

Q—No, only one. A—I never knew what part of Mr. Perry's stock he was to get. I simply told Mr. Hammond that I had no objections to his getting some of Mr. Perry's stock, and I never knew at any time as to the stock, until after I got home from Europe, that was in 1908, that he had some stock that Mr. Perry was to give him that was in partnership with Mr. Perry.

Beatty's contract gave him the specific right to purchase stock in any company floated by the Guggenheim company. He required no authority of any kind to buy Yukon stock, nor was he required to give the Guggenheim company any notice about any purchase of Yukon stock, so that when Daniel Guggenheim consented to Beatty's "getting" part of Perry's stock, it did not mean buying it.

Daniel Guggenheim, referring to a conversation with Beatty, after Guggenheim's return from Europe in 1908, this controversy having arisen during his absence, testified:

(pp. 628-9) I then told him or we had some subsequent talk after that, that I would see to it that no injury would come to him in reference to the matter, that he would get everything he was entitled to, but that I was waiting for the result of the investigation. I said I was perfectly willing when the time came to arbitrate the matter, or refer it to anyone, or have any kind of a fair way to decide what he was entitled to. He said, "Mr. Guggenheim, I will leave it to you to be the arbitrator."

Can one conceive that an employee who had taken a *secret profit* would go to his employer and offer to make that employer the arbitrator?

As I understand it, Justice Gerard held, as a matter of law, that even if the officers of the company knew that Beatty was interested with Perry and assented to it, the company would not be bound unless those officers knew the exact amount of Perry's interest, that is, that it is not enough for an agent to say to his principal, "I have a personal interest in a transaction, are you willing to deal with me on that basis?" but that he must say, "I have a 9% or a 13% interest." If that is the law, it would seem to have been unnecessary to discuss the details as to the facts of this case, because Beatty testified unequivocally that he did not tell Hammond or Guggenheim the exact amount of his interest in Perry's profits and gains, but simply that he was to get a part thereof. They knew whether they regarded it of any importance whether he got a fifth or a quarter or a third of Perry's interest. We claim that such a holding to the law is contrary to the authorities in this country.

In the JOURNAL's article, referring to the profits made by Perry out of the contract with Treadgold, and a part of which Perry agreed that Beatty should have, you say: "Nor would the agreement with Perry have been ques-

tioned if it had been solely for his own benefit." Now that presents the remarkable feature of this case. If Beatty was disqualified from taking profits out of the Perry-Treadgold contract, so was Perry. They were both working for the Guggenheim company. The company paid Perry's expense in making the Yukon examinations. A distinction is sought to be made because Perry's compensation was contingent and Beatty's was fixed by a salary. There is nothing in that. A lawyer working for a client on a contingent-fee basis is as much bound by the rules governing attorney and client as if he were working for a fixed fee.

Daniel Guggenheim said he did not know until 1908 that Perry was getting any profit under the Treadgold contract, but when he did learn it he took no steps to have Perry return this profit to the company; on the other hand, Perry thereafter—after this suit was begun—was made consulting engineer of and a director in the Guggenheim Exploration Co. The question of the respective amounts that Perry and Beatty got for their services, could not have induced the distinction between Perry and Beatty, because Perry got more for three or four months' work in the Yukon and for a two-year contract, which did not obligate him to perform any services unless called for, than Beatty got for four years' services.

This controversy between Beatty and the company arose about Apr. 1, 1908. Justice Gerard in one of his findings says:

> In the summer of 1908, after the expiration of plaintiff's contract with defendant company, defendant company through Daniel Guggenheim, sought to get plaintiff to enter into a new contract for plaintiff's services, as chief engineer and general manager of said company, for a period of years. Plaintiff declined to enter into such contract.

The managing officers of the Guggenheim company knew that Beatty was interested with Perry and assented to it. That is the vital thing. The technical legal questions involved are of minor importance at this time.

HENRY WOLLMAN.

New York, July 29, 1913.

[Our article was simply a summary of Justice Gerard's decision, except for the last paragraph, seven lines, which comprised our only comment.—EDITOR.]

The Michigan Strike

Whether the conditions now obtaining in the copper-mining district of Upper Michigan are the results of a walkout or a lockout are immaterial. The fact remains that the situation approaches that of a strike of the miners, a thing that has not happened in the affected district for a great many years, and that has never before been brought about there by that least-liked and most unscrupulous of all the great labor organizations of this country—the Western Federation of Miners. For it is this and this alone that is responsible for the present situation in the Michigan Copper Country.

Recent press despatches state that 20 of the best known mines of the district are closed down; one mining "captain" is seriously injured as the result of an assault; that small battles have occurred between the sheriff and his deputies on one side and the strikers on the other; that the sheriff is virtually a prisoner and has called on the Governor of the state for troops. And the strike is scarcely three days old. This indeed is "going some," and there are indications, at least to those conversant with the history of the country and its mines, that the strike will not be short-lived one.

According to published reports, the miners have made but three demands: an 8-hr. day; abolition of the one-man drill; recognition of the union. Those familiar with the mines and the conditions of work and its supervision obtaining on surface and underground, know that while the present 10-hr. day is such in theory, it is a misnomer as far as the actual working hours of the miner is concerned.

He goes underground at 7 in the morning and his drill is rarely operating before 8. He takes an hour for lunch at noon and quits work at any time between 4 and 5 in the afternoon in order to get to the shaft for the man-car at five. The actual hours of work can be readily deduced. However, in spite of this, and many other conditions governing the policy of the 10-hr. day, it is believed the mining companies could, if occasion demanded it, concede the 8-hr. day with no loss in profit to themselves. The recognition of the union is a matter which is harder to believe will be so easily solved, involving as it does a policy at utter variance with one which has prevailed in the district since its earliest days, over 60 years ago. But the real stumbling block is undoubtedly going to be the demand for the abolition of the one-man drill, and there is plenty of reason for supposing that the battle will be drawn on this line.

Frequent reference has been made in these columns during the past two years to the progress that has been made in introducing this machine into this district. It was a long time getting there, and it took some time and not a little money to test fairly this innovation, for an innovation it surely was to this region. However, its use is now becoming quite general, and as frequently predicted in the JOURNAL, the possibilities it offers through reduced operating expense, means much to a district, where dividends and successful operation hang on the fractions of a cent in the cost per pound.

It is hard to believe that the mining companies will concede any right of the miners to dictate on this score, where personal safety of the workman is not involved. It is equally hard to believe that the better-thinking class of miners here, those whose fathers and in some cases whose grandfathers have preceded them, even in one mine, will insist on the abolition of this particular type of drill.

To them, it should and probably will mean an added opportunity to demonstrate their efficiency as miners, and they will undoubtedly soon see, if they do not already, that the general use of this drill means an added life for the district, in that it will help make available, ground hitherto not considered profitable. To the inefficient and the man who prefers to draw his pay without giving adequate return, it is an incentive to strike. Obviously, it is this sort that does frequently strike first, dragging unwilling victims with them.

It is to be hoped that the former class will take this opportunity to assert itself. If it does not, it is equally to be hoped that the operators, who know their ground better than all others, will fight it out on this line if "it takes all summer." There is ample reason for believing that they will do just this under the circumstances.

THOMAS THOMAS.

Houghton, Mich., July 27, 1913.

EDITORIALS

The Strike in Michigan

We are used to hearing of strikes, turbulences and riots in such mining districts as Butte, Cripple Creek and the Coeur d'Alene, but not in the heretofore calm and blissful purlieus of the Lake Superior copper region. That is a region of a settled population, of homes, of green grass and of woods. The conditions of living have been far more agreeable there than in the rough regions of the Rocky Mountains where the necessity of men sleeping in bunk houses and the absence of real home life have been some of the complaints put forward by labor agitators in justification of their claims for the extraordinarily high wages which have been demanded and received.

Back in the days of 25c. copper, in 1906-7, a lot of Lake Superior miners, tempted by the high wages, went to Butte. It was not long before they discovered that their net income, the surplus remaining after expenses were paid, was less in Butte than in Michigan, and there was a general return to the old home. Since then, the Lake Superior companies have voluntarily raised wages, this having been done in the early part of 1912, when the price for copper experienced a substantial recovery, and nothing has ever been intimated respecting a reduction, although the price for copper has suffered some material relapses.

Nor have any mining companies in the United States been so paternally solicitous as to the welfare of their employees. We know this from our own observations, which have repeatedly been the subject of articles in the JOURNAL. The state has, moreover, enacted thoroughgoing compensation legislation, which has been accepted by the companies in a spirit of coöperation. If any mining population in the United States, and we know almost all of the important mining districts by having been on the ground, ought to be contented, we consider that it is the mining population of Lake Superior.

What, then, are the grievances that have led to this strike, which has been brewing for a long while? One of them is alleged to be the introduction of the one-man drill. This is the same old objection of labor-unionism, first to the use of machinery at all, then to the use of improved machinery. What matters it to rehearse the familiar old arguments? What matters it if the workman profit along with employer, wherein Lake Superior experience has differed in no wise from experience elsewhere?

Of course, increase in wages is to be demanded. One of the strike leaders imported from the Rocky Mountains is quoted as saying that while it is true that the Lake Superior companies have made increases, their scale will stand several more before it attains the Montana level. The Lake Superior miners who went to Montana in 1906-7 and went back can throw some light upon this subject.

The nub of the Lake Superior strike is clearly the recognition of the Western Federation of Miners, which has obtained a foot-hold in this previously peaceable district and wants to strengthen it, of course, to its own benefit in dues, etc. The lawlessness by which this is to be promoted apparently starts with the young, unmarried Huns, Finns, Slavs, etc. We can hardly conceive of any of the old-time Cornishmen going in for that sort of thing. Be this as it may, we are now witnessing the strange spectacle of Calumet and Painesdale under the guard of infantry, cavalry and artillery.

The Situation in Mexico

During the last week it is clear that Mexican affairs have been rapidly approaching a crisis. So long as the Huerta government was unrecognized by the United States no money to speak of was forthcoming from Europe. The foreign loan that has been talked of so much turns out to be little more than options to European bankers. Such money as the Mexicans have been allowed to have takes care of scarcely more than maturing obligations. In these circumstances a strong effort to secure American recognition by suasion and by threats was made. Ambassador Wilson came home to urge this. Previous to his return he was held rather high in popular estimation, but his diplomatic reputation blew up with his blazing indiscretions upon arriving in New York. The President apparently intends to stand calmly by his policy of non-recognition and there are indications moreover of the exercise of a stronger hand in maintaining the rights of Americans who find themselves in danger in Mexico.

Lake Iron Ore Rates

The railroads serving the Old Range section of the Lake Superior iron region could not very well advance rates to the Lake ports from the mines this year in face of the quite recent decision of the Interstate Commerce Commission ordering the Minnesota roads to reduce their rates by 25%; but they sought to attain their end by indirection. The rate from mines to Lake ports was fixed at 40c. per ton, the same as for several seasons past but an additional 5c. per ton, called a "loading charge" was imposed. No such charge has heretofore been made and this practically amounted to an increase of 12½% in the freight rate. Moreover, this charge is increased by 0.25c. a day for storage, if ore remains on the shipping docks for over 10 days.

Naturally this addition was not approved by the shippers, and an appeal to the Interstate Commerce Commission was taken by the Newport Mining Co., Corrigan, McKinney & Co., and other shippers, the defendants being the Chicago & Northwestern, the Chicago, Milwaukee & St. Paul, the Duluth, South Shore & Atlantic, and the Lake Superior & Ishpeming roads. For some weeks past the Commission has been taking testimony in Chicago, chiefly on the side of the railroads, and some interesting facts have been submitted.

In 1890-93 the rate to the ports was 70c., but this was reduced by graded steps to 40c., which has been the established charge for several years, and to which no ob-

jection has been made. The selling price of ore this season is much higher than when the 40c. rate was established. In their plea the railroads set forth these facts, and also say that handling the business has required the building of costly ore docks and the installation of machinery which has been expensive to build and operate. For this they claim they are entitled to some recompense in the form of the loading charges.

There is some show of justice in this plea. It does not mention, however, that while many improvements have been needed, a very large and profitable business has been built up, from which there is a heavy return; to say nothing of the indirect profit resulting from the demand for stores for the mines and for the large population which has grown up around them. These points, however, will doubtless be brought out as the shippers' side of the case is presented.

The railroad rate from the mines to the Lake is a deduction from the value of the ore, since that is sold f.o.b. Lake Erie port and the seller pays all charges to that point. The provision of large terminal facilities, docks, etc., has always been held to be a necessity where a large business is to by secured and as an incident to that business. Without pronouncing on the reasonableness of the rate, it seems as if a flat advance would have been better than the indirect method adopted.

❖

Respecting Arbitration

What is sauce for the goose is not sauce for the gander in disputes between organized labor and its employers. The conductors and trainmen of the Eastern railways voted to increase their wages, about 7% voting in the negative. Why even 7% should vote against having their pay raised is only partly comprehensible. The railways having refused to grant the increase that was voted, a general strike, together with all the horrors of interrupted food supply of the cities, etc., was threatened. This was averted by the action of the President in securing the passage by Congress of a new arbitration law agreeable to both parties. Then it appeared that the railway managers proposed to submit some things to arbitration as well as the men. The ideas of the railway managers were of the following nature:

> When a minimum day's wage is paid in any class of service it shall entitle the railroad to the full mileage or hours of service paid for.
>
> In no case shall double compensation be paid.
>
> That consideration be given to a reduction of existing rates of pay of yard brakemen and of passenger conductors and trainmen on long continuous runs, where there is an opportunity to make excessive mileage in a limited number of hours.
>
> Employees in two or more classes of service on continuous duty or under continuous pay shall be paid the rates applicable to the different services performed with a minimum equal to 10 hours at the lowest paid service.
>
> On passenger and freight trains, where under extra-crew laws additional men are required, the rate of pay for all brakemen shall be 30% below rates established for brakemen on trains not affected by such laws.

To the neutral outsider such points seem reasonably debatable in a settlement of grievances, unless it be held that the employee is the only party who can have a grievance. The railway union is evidently obsessed by the latter conception, inasmuch as a general howl arose from it and a renewal of the threat to strike, arbitration go hang. From the union standpoint, arbitration is apparently of no use except as a medium of playing "heads I win, tails you lose."

❖

The Lake Strike and the Copper Market

The strike at the Lake Superior mines has apparently had a good deal of effect upon sentiment in the copper market, especially abroad. The idleness of this group of mines, which produces about 18,000,000 lb. of copper per month, will naturally restrict production, but perhaps not to so great an extent as is expected.

After the mines were closed down, operations continued at the smelteries, and probably will continue so long as the stocks of "mineral" last. Presumably there is no great stock of mineral at the works in Michigan, but the Calumet & Hecla company always used to carry a large stock at its Buffalo works, and we have never heard that such policy had been altered. However, the strike at the mines will no doubt reduce production to some extent, depending upon its duration, and this ought to be reflected quickly in the refiners' statistics, inasmuch as the Lake producers are both smelters and refiners and their output suffers no loss of time in transit.

With respect to the immediate market supply of Lake copper, there ought not to be any special alarm, the Lake companies having been carrying for some time past an undue proportion of the accumulation. We fancy that on July 1, the time of the last report, they must have had at least 20,000,000 lb. on hand, against only about 29,000,000 lb. being carried by the electrolytic refiners. During the long period of absence of buyers in the copper market, the principal Lake producer was more indifferent than anybody else; nor did it participate in the slashing of prices at the end. As things have turned out its policy may prove beneficinal all around.

❖

A Semi-Automatic Mine Switch

The switch described by A. H. Bromly as a Detail of Practical Mining in this issue, is one of the little kinks about a mine whose value is apparent to the miner, even if it has no direct connection with the cost sheet. There are many points of mining practice which cannot be expressed in dollars and cents. Many methods or appliances must be adopted or rejected on the basis of common sense rather than on any evidence obtained from examining costs. This is rather the fault of the cost sheet than the result of any quality inherent in the method or appliance. The best of cost-keeping systems is only an approximation; too much is distributed *pro rata*. Much as the harassed superintendent may complain of the detail required, the plain truth is that there is not enough detail. A perfect cost-keeping system should show in figures the inter-relations of all operations. The effect on costs of any new installation, small or large, of any change in operations, should be calculable in advance. It is not, and to be frank, probably it never will be. To return to our treadle switch: Such a device would cost a small amount to install, an amount which could be estimated rather closely. What the consequent reduction in tramming costs would be cannot be stated, but it would unquestionably more than pay interest, depreciation, and repairs on the installation.

BY THE WAY

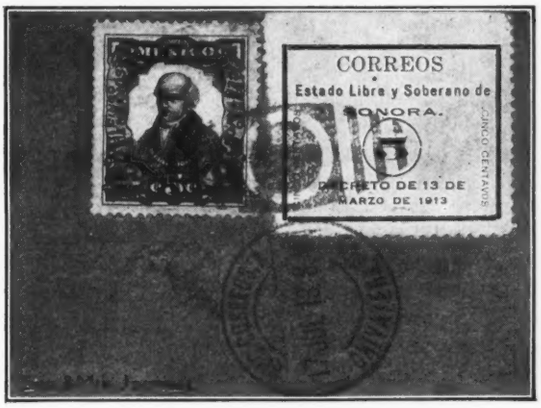
It is whispered that the Government would like to drop its suit against the Steel Corporation but does not know just how to let go. The Hon. A. O. Stanley has been quiet since the exposure of his experience with the Wolf of Wall Street, in which the legislator played the part of the poor old grandmother in Little Red Hiding Hood.

⁂

The experimental ore-dressing plant of the Department of Mines at Ottawa, Canada, erected according to the plans of Doctor Haanel, Director of Mines, is approaching completion. This will be the best equipped and best designed experimental works of this kind whereof we know. In the same plant there is an excellent fuel-testing installation, including gas producer, experimental boiler, engines, etc., which is already in use.

⁂

The accompanying halftone shows a portion of an envelope received by the JOURNAL from Sonora. Apparently



STAMP OF THE STATE OF SONORA

the left-hand stamp must be used to comply with the International Postal Union Regulations, while the right-hand stamp carries it through Sonora.

⁂

Elbert Hubbard thus expresses his views respecting scientific management as expounded by Louis D. Brandeis: He (Brandeis) "leaps into fame by appearing before the Interstate Commerce Committee and stating that the railroads of America are wasting a million dollars a day through extravagance, collecting this money from the dear people. He suggests that they can cut their coal bills in two by consuming their smoke—that they start goose-farms and sell the honks to automobiles—and reveals long lists of figures to prove his case."

⁂

The prohibition of the export of crude platinum from Russia, agreed upon over a year ago, has never been enforced, since it is said that it will interfere with the provisions of some of the commercial treaties with other nations. The object of the proposed law was to secure the establishment of refineries in Russia and the export of the metal in fine instead of crude form. Now a new law has been brought forward to secure the same object. It provides for an export duty of 30% on crude metal, which is practically a prohibition. It is said that this law will probably be enacted, time for the construction of refining works being allowed before it goes into operation.

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Curious ideas often get into the heads of congressmen. For example, the other day, Senator Bristow discovered that the Democrats had placed a duty on raw amber of 10%. He suggested that amber was produced in New Jersey and Massachusetts. Senator Hughes, of New Jersey, said that if amber was produced in New Jersey, he had never known it. Senator Martine said that he was certain it had never been produced in New Jersey. Senator Oliver discovered that by putting the duty on crude amber the Democrats had added probably $35,000 in revenue, but by reducing it on the manufactures of amber they had lost about $78,000 annually. The paragraph went over.

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Decision in the Flotation Litigation

According to a despatch received from Butte, Mont., on July 29, Judge Bourquin has handed down a decision in the suit of Minerals Separation, Ltd., against James M. Hyde, adverse to Hyde. According to the summary of the decision transmitted by wire, Judge Bourquin in reviewing the evidence sharply contrasted the Minerals Separation patents with the Froment patent, holding that they are radically different and that the doctrine of equivalents had no application. He decided, moreover, that the defense against the Minerals Separation patents on the grounds of lack of novelty and anticipation was not established and held that the Minerals Separation patents upon which suit was founded are valid in respect to all claims in issue, and that there was an infringement by the defendant, Hyde.

Consequently, a decree as demanded in the bill of complaint, otherwise than as to treble damages and for accounting before the masters, was ordered. This decision, of course, refers to the use of the flotation process by the Butte & Superior Copper Co. There has been no news as to whether the defendant would take an appeal to a higher court, but such action is probably to be expected.

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Something New in Mexico

A staff correspondent of the *Evening Sun* reported from Mexico under date of July 29 that President Huerta and the Mexican people have shown a sudden change of spirit toward the United States.

The cause is undoubtedly the peremptory message which President Wilson ordered communicated to the Mexican government touching redress for the shooting of Charles B. Dixon, U. S. immigration agent, at Juarez, and requiring the release of two American prisoners.

Nelson O'Shaughnessy, American Charge d'Affaires, received from Washington a note couched in terms that are decidedly peremptory, demanding the court-martial and immediate punishment of the Federal soldiers who shot Immigration Agent Dixon; also the release forthwith of McDonald and Bissell, United States citizens, whom Pascual Orozco recently captured and condemned to death.

O'Shaughnessy lost no time in calling on President Huerta and laying the American Government's demands before him. Huerta at once promised the immediate release of McDonald and Bissell, as well as the summary punishment of the shooters of Dixon.

The results of O'Shaughnessy's visit were instantaneous No sooner had the American Charge d'Affaires left the National Palace than President Huerta summoned his Foreign Minister and directed him to take the necessary steps to comply with the demands of the United States.

The Copper Country Strike

SYNOPSIS—Western Federation of Miners directly responsible for strike, unionism being the real issue; all mines closed down to fight to a finish; militia called to hold rioting in check.

The first general strike in the history of the Lake Superior copper country was called by the Western Federation of Miners, Wednesday morning, July 23. On July 14, the local union officials asked for a conference with the various mining companies, naming July 21 as the limit of time in which a reply was to be made. This communication was not acknowledged and the strike was ordered. It was not precipitated without abundant warning. For a year past it had been persistently reported that the summer of 1913 would see a test of strength between Western Federation and the mine operators. While conditions as to wages and working and living conditions in the copper country have always been exceptional, rumors of an impending strike has long affected business conditions. Labor unrest has driven hundreds of good miners out of the district, as they did not choose to remain while a strike was impending. Business men have hesitated over purchases, and conditions have been such as almost to paralyze the development of the district along commercial lines. The strike was a bad thing for the copper country, long before it actually was declared. Therefore there was more relief than surprise at the final rupture; relief because the prospect of labor trouble had hung over the copper country like a pall and it is unquestionably to its benefit to have the situation cleared up by a final clash on the issues raised.

Unionism the Real Issue

In many of its aspects the strike is unique. The strike began with an almost entire lack of preliminaries. The only formal representation to the mine operators was a recent presentation of a memorial against the one-man drill, for shorter hours and more pay. The mine operators ignored it. After a brief interval the strike was ordered and the men went out; the federation members in obedience to their leaders, and the many others because of intimidation or because the companies resolved to make no effort to operate for the time being. There was no exchange of views, no suggestion of arbitration. Both operators and federation were apparently willing to join in a finish fight on the questions involved.

The real and underlying issue is recognition of the union. The copper country has always been an open camp. Organization has been sporadic, and the companies have never treated with the unions. They employ union and non-union men indiscriminately. Union men have been under no ban, but it has been the consistent policy of the operators to treat with their men as groups of employees, not as members of unions. The Western Federation of Miners has long had envious eyes on the Michigan copper country. For many months its agents have been working a foothold there. It has been uphill work, but it has persisted until it has a representation of several thousand miners. The influence of the federation first made the strike possible and then precipitated it.

A contributory cause of the strike is that for the last year there has been a scarcity of labor for underground tramming, which resulted in a large number of outside men being brought into the district. This was the opportunity that the Federation had been waiting for; the chance had come for it to extend its membership and influence in the copper country by enrolling as many of the newcomers as possible.

Specifically the Federation demanded recognition of the union, an 8-hr. day, a $3 minimum wage, and the abolishment of or a change in the operation of the one-man drill. Officials of the Federation claim that they are backed by the national organization and the American Federation of Labor with authority and funds to prolong the strike for several months.

All Mines Close Down

With the exception of the Hancock and the Winona, all the mines in the district were closed down Wednesday. No attempt on the part of the management was made to continue operations. The English and Irish miners are apparently opposed to the strike. The Finns and Austrians are strongest in the union and practically every miner of these two nationalities has joined the strikers. A week before the strike, the Federation officials stated a membership of about 4000. The day the strike was called they claimed an increase of 9000. About 70% of the miners are opposed to the strike. The willingness of so many of the miners to go to work resulted in serious trouble at various places. The most serious trouble is centered at the Calumet & Hecla shafts. Several mass meetings and parades resulted in riots at Calumet. The strikers, armed with rocks, clubs and drills, marched to the various shafts and prevented all men from going underground, as well as stopping all surface working and closing the shafts. Thursday, every mine in the district was closed. The several hundred deputies were unable to handle the situation and Thursday, Governor Ferris was requested to send aid.

Recognizing the seriousness of the strike, the governor ordered the entire National Guard to leave at once for the copper country. The Calumet engineers were joined by the Houghton light infantry at the Calumet armory Thursday afternoon. Special trains Friday and Saturday brought in companies from the lower peninsula, and by Sunday, it was expected that two troops of cavalry, two companies of artillery and all the infantry of the entire National Guard, numbering 2400 to 2500 men, would be in camp around Calumet. Besides the troops, there were more than 2000 deputies on duty. The state troops will remain in the district until the trouble is over. With the complete closing down of all properties, things are quieted. Practically all the stamp mills are closed because only a day's run of rock is kept on hand at most of the mills. The smelting plants will probably continue running for a few days.

The Federation officials state that they are strongly opposed to any rioting, violence or damage to mining property. At several shafts they have permitted the pumps to continue running. All they ask for is a hearing by the mine management. The managers, however, will hold no conference until all rioting and disorder is stopped. The managers have made no attempt to open the mines and many of the Cornish miners, opposed to the strike, have left for the iron country.

PERSONALS

Dr. L. D. Ricketts arrived in New York, July 30.

H. C. Enos has returned to Mexico City from Pachuca.

H. S. Coe recently left San Francisco on his way to Nicaragua.

Ludwig Vogelstein is returning to New York from Europe by S.S. "Imperator."

Paul R. Fanning, metallurgist to the Philippine Bureau of Mines, is visiting California.

W. R. Ingalls, editor of the "Journal," expects to go to Montana about Aug. 10 next.

T. R. Drummond, mining superintendent of the Inspiration Consolidated, has resigned.

J. R. Finlay will return to New York about July 30 from a trip several weeks in the West.

J. Parke Channing is in Houhton, Mich., this week, and is expected in New York next week.

R. H Vail, assistant editor of the "Journal," is visiting the copper smelting works of Arizona.

John M. Fox has opened an office at Tonopah, Nev., as operative, consulting and examining engineer.

B. A. Bosqui will leave San Francisco shortly to take charge of the new mill of the Commonwealth Mining Co., at Pearce, Arizona.

Samuel Sanford, formerly associate editor of the "Journal," and now in the Bureau of Mines at Washington, has been visiting New York.

C. W. Wright, manager of the mining interests of Lord Brassey in Sardinia, is visiting in this country, on vacation. He will return to Sardinia in September.

Jack E. Shaw, recently assistant superintendent of the Gaston Gold Mining Co., is now superintendent of the Birchville Mining Co., at Graniteville, California.

Benjamin E. Purser has become general superintendent of the mines of the Woodward Iron Co., Bessemer, Ala. I. V. Dalrymple has been appointed his assistant.

Walter J. Radford has accepted the position of engineer for the company operating the Lady Belle Lease at Eagle, Colorado, and will have his headquarters at Denver.

Thos. P. McNamara, until recently foreman of the Combination mine, Goldfield, Nev., passed through New York recently on his way to the Sudbury district in Ontario.

Fred. Searles, geologist for the Goldfield Consolidated Mines Co. spent a day in New York recently. He will attend the International Geological Congress at Toronto.

The engagement is announced of Miss Elizabeth McNear, of Oakland, Calif., to John Power Hutchins, of St. Petersburg, Russia. The wedding will take place in October in London.

Archibald Johnston, vice-president of the Bethlehem Steel Corporation, has gone to China on a business mission connected with important naval contracts that are to be placed by that company.

Bernard MacDonald, well known in mining circles of Mexico and the United States, is reported to have been captured by Federal troops under Orozco in Chihuahua, and imprisoned there under sentence of death. He has just been released.

H. C. Wilmot has resigned as superintendent of the Colorado Mining Co., Aroroy, Philippines, and has accepted the position of manager of the Syndicate, an adjoining property, which is at present building a 100-ton cyanide mill.

Percy E. Barbour, manager of the Uwarra mine, Candor, N. C., was in New York for a few days this week. Mr. Barbour recently suffered an injury to his knee, on account of which he is going to a hospital in Baltimore for treatment.

Harry W. Newton, general superintendent of the North Washington Power & Reduction Co., of Republic, Wash., has been in Spokane negotiating for the purchase of a 600-hp. Corliss engine, to be installed at the mill of the company in Republic.

Dr. S. Gregory, representing the Minerals Separation Co., Ltd., has been in this country for several weeks and will remain here for some time longer, the American business of th company having developed to such an extent as to require much attention.

E. B. Tinker has been appointed superintendent of the Superior & Boston mine at Globe, Arizona; he has been at the Miami for five years past, recently in charge of the New Keystone property. W. A. Sullivan has been appointed chief clerk and purchasing agent; he is from the Ahmeek mine in Michigan.

Joseph MacDonald, general manager of the Consolidated Mining & Milling company of Guanajuato, Mexico, has been on trial at Juneau, Alaska, charged with the murder in 1902 of N. C. Jones, a mission worker at the Treadwell mine. MacDonald was then manager of the Treadwell mine. The missionary demanded that he close the mine on Sunday. MacDonald's plea is self-defense.

Governor Strong, of Alaska, has appointed William Maloney, of Nome, territorial mine inspector, under the provisions of chapter 72 of the Alaska session laws. Under this law the territorial mine inspector has been assigned to the mining sections of the second and fourth judicial divisions, with headquarters at Nome. The office carries a salary of $2500 per year, with actual traveling expenses in the sum of $2500 a year. Mr. Maloney enters upon his duties Aug. 1. The appointment is for a period of two years. He is a well known mining man of Seward Peninsula, where he has been engaged in mining for the past 12 years. Besides being a practical miner, he possesses the necessary technical knowledge of mining prescribed by the law creating the office. The territorial mine inspector will be under the supervision and direction of the governor and the Federal mine inspector.

OBITUARY

U. G. Wolf. of El Paso, Texas, is reported to have been killed by Mexican outlaws on July 16, at the Creston-Colorado mine in Sonora.

Gordon Montgomery, electrician at the Temiskaming mine Cobalt, Ont., was killed instantly, July 22, by the heavy voltage while laying a line from an electric pump at the mine.

Arthur M. Thomas, a miner well known in Butte, Mont., died July 16, at San Francisco, where he was on a visit. He was 37 years old and had been a resident of Butte the greater part of his life.

James Conmee, of Port Arthur, Ont., died at Prescott, Arizona, recently, aged 64 years after a long illness, having gone to Arizona for his health about six months ago. Mr. Conmee was a native of Sydenham, Ont., and served in the American civil war, after which he went into business in Port Arthur as a railway contractor and was largely interested in mining and the lumber trade. He was the first president of the Canadian Mining Institute in 1894, and became president of the Canadian Mines Development Co. in 1896. He took a prominent part in public life and for several terms represented his constituency in the Ontario Legislature and in the Canadian House of Commons, retiring two years ago.

SOCIETIES

University of Utah—By the will of James McGregor, recently deceased, the School of Mines has been made the beneficiary for $50,000. Mr. McGregor, whose death occurred in Terre Haute, Ind., had large mining linterests in Utah.

American Peat Society—A joint annual meeting of the Canadian and American Peat societies will be held at Montreal, Canada, Aug. 18-20. Opportunity will be given members and their friends to visit the two largest peat fuel plants on the Continent. These are located at Farnham and Alfred.

American Chemical Society—The 48th annual meeting will he held at Rochester, N. Y., Sept. 9-14. All papers for the meeting must be in the Secretary's hands on or before Aug. 22, or in the hands of secretaries of divisions by Aug. 20, in order to be on the program; especially the secretary of the Organic Division requests that organic papers be sent direct to him. By vote of the Council no papers can be presented at the meeting that are not printed on the final program. The following are the addresses of the divisional and sectional secretaries: Industrial Division, S. H. Salisbury, Jr., Lehigh University, South Bethlehem, Penn.; Physical and Inorganic, R. C. Wells, U. S. Geological Survey, Washington, D. C.;

Fertilizer, J. E. Breckenridge, Carteret, N. J.; Agricultural and Food, G. F. Mason, care of Heinz Company, Pittsburgh, Penn.; Organic, Wm. J. Hale, University of Michigan, Ann Arbor, Mich.; Pharmaceutical, Frank R. Eldred, 3325 Kenwood Ave., Indianapolis, Ind.; Rubber, Dorris Whipple, care of The Safety Insulated Wire & Cable Company, Bayonne, N. J.; Biological, I. K. Phelps, Bureau of Mines, 40th and Butler Sts., Pittsburgh.

International Exposition of Safety and Sanitation—The first exhibition ever held in America will take place in New York City, Dec. 11-20, 1913, under the auspices of the American Museum of Safety. Safety and health in every branch of American industrial life, manufacturing, mining, transportation on land and sea, business, engineering, in all of their subdivisions will be represented at this exposition. It will be the first step toward making a representative exhibition of the progress of safety and preventive methods in America. There will be absolutely no limit to the scope of the exposition. It will embrace everything devoted to safety, health, sanitation, accident prevention, welfare and the advancement of the science of industry. By a special act of Congress exhibits from Europe and other foreign countries are to be admitted free of duty. European employers have cut their accident and death rate in half by a persistent campaign for safety. There are 21 museums of safety in Europe. All of these various museums will contribute to the American Exposition.

INDUSTRIAL NEWS

The Chile Copper Co. is going to use Symons disc crushers in its mill at Chuquicamata, Chile.

After operating two Hardinge mills for 14 months, the Tomboy Gold Mines Co., at Telluride, Colo., is installing two additional mills of the same type.

The Ingersoll-Rand Co., 11 Broadway, N. Y., has received an order from the Inspiration Consolidated Co., of Miami, Ariz., for compressors and compressed-air locomotives.

It is reported that the Vulcan Iron Works, of Wilkes-Barre, Penn., has received the contract to build three rotary washers and a dryer for the West Coast Smelting & Refining Co., of Tecolete, Sonora, Mexico.

The General Electric Co., Schenectady, N. Y., has received an order from the Inspiration Consolidated Co., at Miami, Ariz., for a hoisting equipment. The hoists will have a capacity of 10,000 tons every 14 hours, lifting 630 feet. They will be automatic and of the flywheel type with Ward Leonard control.

The Keystone Driller Co., of Beaver Falls, Penn., has started the publication of "The Keystone Drill Magazine," which is concerned with problems of well drilling, pumping and mineral prospecting. The first issue is dated July, 1913, and contains articles on "Electric Cable Drills in a Cement Quarry," by F. L. Jorgensen, and "Steam Traction Cable Blast Hole Drills in Earth and Rock Excavation," by Albert D. Blakeslee.

TRADE CATALOGS

C & C Electric & Manufacturing Co., Garwood, N. J. Bulletin 513 C. Electric Arc-Welding Apparatus. Ill.; 28 pp., 10x7½ in.

This bulletin contains a complete description of its new multiple-unit arc-welding outfit, by means of which several operators can work from the same machine and use either graphite or metallic electrodes and perform all kinds of welding operations by means of the electric arc. Copies can be obtained by addressing the office in Garwood.

Ingersoll-Rand Co., New York. Ingersoll-Rand Products. Illus., 140 pp., 6x9 in.

This booklet is very complete, not only in illustrating the entire line of the company's production, but the dimension and the capacity tables shown with each type of machine are of great assistance to an intending purchaser in selecting machines of a specified type and size to meet certain requirements. It also tells of the many uses of compressed air in different fields, while about 20 pages are devoted exclusively to tables of horsepower required to compress air from atmospheric pressure to various gage pressures, efficiency tables of air compression at different altitudes, compressed-air transmission tables, drill capacity tables, indicator charts, etc. It is profusely illustrated with halftone and sectional views of the various machines and anyone at all interested in compressed air and its applications should not be without it. A request to the New York office will bring a copy.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

MINE-CAR BRAKE. Ora Mobberly, Corbin, Ky. (U. S. No. 1,067,050; July 8, 1913.)

ALUMINUM—Solder for Aluminum. Charles H. Frantz, New Orleans, La. (U. S. No. 1,067,016; July 8, 1913.)

FURNACE—Tilting Metallurgical Furnace. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,066,995; July 8, 1913.)

STEAM SHOVELS—Jack for Power-Operated Shovels. George T. Kleven, Winesap, Wash. (U. S. No. 1,067,038; July 8, 1913.)

SEPARATOR for Ores (Centrifugal). John R. E. Sievers and Russell P. Howard, Butte, Mont. (U. S. No. 1,067,766; July 15, 1913.)

REFINING—Process and Apparatus for Refining Metals by Heating. A. Helfenstein, Vienna, Austria. (Brit. No. 13,577 of 1912.)

AMALGAMATOR. Alfred L. Lawson, Chicago, Ill., assignor of one-half to George S. Welsh, Chicago, Ill. (U. S. No. 1,067,352; July 15, 1913.)

COPPER RECOVERY—Apparatus for Recovering Copper from Its Ores. Henry M. Wilcox, Chicago, Ill. (U. S. No. 1,066,968; July 8, 1913.)

DRILL—Rock Drill. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,066,901; July 8, 1913).

FURNACES—Improvements in and Relating to Furnaces for Metal Heating and Metallurgical Purposes. J. A. Hill, Sheffield, Eng. (Brit. No. 12,349 of 1912.)

LEAD AND ZINC—Treating Complex Ores or Their Concentrates. William Morley Martin, Redruth, England. (U. S. Nos. 1,066,829, and 1,066,830; July 8, 1913.)

MINE-CAR WHEEL. William Joseph McDonald, Huntington, W. Va., assignor to American Car & Foundry Co., St. Louis, Mo. (U. S. No. 1,066,638; July 8, 1913.)

SMELTING FURNACE. Charles A. Kuenzel, Buena Vista, Colo., assignor to The Kuenzel Gas Producer & Smelter Construction Co. (U. S. No. 1,067,481; July 15, 1913.)

MELTING FURNACE—Gas-Fired Melting Furnace. William G. Kranz, Sharon, Penn., assignor to National Malleable Castings Co., Cleveland, Ohio. (U. S. No. 1,067,040; July 8, 1913.)

LENORA MINING CO. (Corcoran)—This is a new corporation with a capitalization of $500,000. The incorporators are James H. Baley, G. N. Sherban, Lenora Sherban and J. F. Schattgen.

LEACHING—Apparatus for Concentration of Ore Values. Charles S. Bradley, New York, N. Y., assignor to Bradley Copper Process Co., Jersey City, N. J. (U. S. No. 1,066,880; July 8, 1913.)

EXTRACTION—Process of Extracting Metals from Their Ores. Henry B. Slater, Riverside, Calif., assignor of one-half to Ransom B. Shelden, Riverside, Calif. (U. S. No. 1,066,855; July 8, 1913.)

ROCK-DRILLING MACHINE. Daniel Shaw Waugh, Denver, Colo., assignor, by mesne assignments, to The Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,067,388; July 15, 1913.)

CRUSHERS—Mantle for Crushing Heads of Gyratory Rock Crushers and the Like. David Gavine Hunter, Simmer, and Thomas George Murton, Jack, Transvaal. (U. S. No. 1,066,277; July 1, 1913.)

TIN—A Process or Processes for the Purification or Recovery of Tin from Alloys or Mixtures Containing Smaller Quantities of Other Metals. P. Bergsoe, Copenhagen, Denmark. (Brit. No. 21,223 of 1912.)

EXCAVATING APPARATUS. James E. Redmond, Crandall, Ga., assignor of one-fourth to Eldridge L. Bates, Crandall, Ga., and one-fourth to Judge J. Bates, Etowah, Tenn. (U. S. No. 1,066,655; July 8, 1913.)

FLOTATION PROCESS—Ore Concentration. Edward Hoit Nutter, Berkeley, Calif., and Henry Lavers, Broken Hill, N. S. W., Australia, assignors to Minerals Separation, Ltd., London, England. (Cl. 83—85.) (U. S. No. 1,067,485; July 15, 1913.)

CONCENTRATION—Improvements in and Relating to Concentrating Apparatus for Separating Metals, Ores and Other Substances in Wet Recovery Processes. W. E. Cox, Lelant, and H. McGill Morris, St. Buryan, Cornwall. (Brit. No. 5975 of 1912.)

NICKEL—Method of Electrolytically Recovering Nickel. Horace L. Wells, New Haven, Conn., and Tom Cobb King, East Orange, N. J.; said Wells assignor to said King; Mary H. King executrix of said King, deceased. (U. S. No. 1,067,698; July 15, 1913.)

SULPHUR AND PHOSPHORUS IN IRON—Process of Removing Sulphur and Phosphorus from Iron and Similar Metals. Albert E. Greene, Chicago, Ill., assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. (U. S. No. 1,065,605; June 24, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—July 22

Advantage to Nevada and Sierra Counties will result from widening the gage of the Narrow Gage Railroad. A meeting by the stockholders of the road was recently held to increase the bonded indebtedness from $162,000 to $662,000. Application for this increase has been granted by the state railroad commission. The road extends from Colfax on the Southern Pacific to Nevada City and is the only railroad in Nevada County. Without good wagon roads into other sections of the county the railroad has not been of the greatest advantage to the more remote mining districts. With the broadening of the railroad and the building of a new road from Nevada City to Alleghany, connecting North Columbia and Moores Flat, it is believed that the impetus given to the mining industry in northern Nevada and southern Sierra counties will ultimately result in extending the railroad north from Nevada City.

Exploration of the Copper Belt Extension on the west side of Sacramento River in Shasta County, by the Mammoth Copper Co., is reported to have confirmed the results of diamond drilling by the Shasta Copper Exploration Co. The Exploration Co. did about 6000 ft. of diamond drilling in 1911 in the Stowell or Webster group of 23 claims on Spring Creek southwest of the Balaklala, covering the principal territory between the Balaklala mine and the Iron Mountain mine. The situation of the claim made the property attractive to the Balaklala Copper Co., but when the Coram plant was permanently closed down the attention of the Mammoth Copper Co. was attracted to the prospects. The diamond drilling was done under the management of M. E. Dittmar of Redding one of the largest stockholders in the Exploration Co. The Mammoth Copper Co. has a purchase option or bond on the claims and it is not unlikely that a purchase may be consummated provided continued development proves as satisfactory as it has been in the 800-ft. tunnel.

BUTTE—July 24

Opposition to Merger of the Tuolumne with the Butte Main Range company is likely to develop and some of the local shareholders of Tuolumne are threatening litigation. The Tuolumne and Main Range are owned and controlled by allied interests.

An Increase in Copper Production may be made now that the copper mines of Michigan are closed down because of the strike, and according to reports they are likely to remain closed possibly for several months if both sides remain as firm in their determination not to yield as at present expressed. Then the Anaconda company may largely increase its production to keep the supply up to the demand. The Anaconda, the North Butte and East Butte can easily increase their outputs say by from 8,000,000 to 10,000,000 lb. per month and this in a large measure will make up for the loss in supply by the Lake companies. The mines of these three companies have large ore reserves and all the properties are in better condition now than ever before in their history. The Great Falls reduction plant can treat much more ore than is now being treated, the same thing is true of the Washoe at Anaconda and the East Butte plant. If production, however, does not increase considerably during the remaining five months of the year the Anaconda company will have produced about 25,000,000 lb. more of copper in 1912 than in 1913. For the six months ended June 30, 1913, production was a little more than 17,000,000 lb. less than for the same period of last year. There is talk among the Butte union members of $1 or possibly $2 assessment per month per member for the support of the Michigan strikers.

A Purchase by the St. Paul Ry. of the line from Butte to Great Falls from the Great Northern is a subject discussed here by railroad men who profess to have the information that negotiations to that end have been going on. The chief revenue of the Hill road from Butte to Great Falls comes from the ore-hauling contract with the Anaconda Copper Mining Co., and it is pretty well understood that the Anaconda company will not renew the contract, which has yet two or three years to run. The Chicago, Milwaukee & St. Paul Ry., which, through interlocking directorates, is closely allied to the Anaconda and Amalgamated companies, has been counted on to do the Great Falls ore hauling when the Great Northern contract expires, but the method has not been surmised until recently. The road will be electrified when taken over by the St. Paul. J. J. Hill is also expected to bring a new line into Butte by the time the Great Falls branch is sold. The talk among railroad men is that the Mondak cutoff, now being built toward Lewiston will be connected with the Billings & Northern and a line from the latter extended to Helena and on to Butte by the way of Whitehall and south to connect with the Gilmore & Pittsburgh road, which now runs from Armstead on the Oregon Short Line to Salmon City, Idaho, presumably a link in a Hill road to San Francisco. Preliminary surveying has been started on the proposed Butte, Wisdom & Pacific Ry., the first line being run from Divide to Ralston a distance of 27 miles, and it is expected that construction work will be begun before the close of this year.

SALT LAKE—July 26

The Alta District, including Little and Big Cottonwood, is one of the oldest mining camps in Utah, the first ore discovery having been made in 1864. Data regarding the production and history of the camp have recently been collected. Alta is in the Wasatch Mountains, about 18 miles west of Salt Lake City, and 15 miles from the nearest railroad station at Sandy. Most of the ore is hauled by way of Little Cottonwood Cañon, although shipments are also made through Big Cottonwood. Mining is made difficult by the high altitude and heavy snowfall, the camp being snowed in for the greater part of the year. The melting snow hampers operations. Most of the ore mined in the past has come from above the water level and in order to reach to greater depth in the future, tunneling will probably be resorted to. The deepest shaft in the district is that at the Prince of Wales mine, which is 900 ft. deep. The production in silver, lead, copper and gold has been estimated at approximately $27,000,000. The Flagstaff, with an estimated production of $8,000,000, and the Emma, with an estimated production of $5,000,000, were the two largest producers. The other principal mines in the order of production were: the Vallejo & North Star, Prince of Wales, Grizzly, Maxfield, Columbus Consolidated, McKee & Resolution, City Rocks, Albion, Toledo, Savage & Montezuma, Nabob, Oxford & Geneva, Peruvian, etc. Among the properties producing at present are the Michigan-Utah, which includes the old Grizzly, City Rocks, and other properties, the Alta Consolidated, Columbus Extension and South Hecla. Development is being done in various parts of the district, and shipments of ore accumulated during the winter are being sent out.

DULUTH—July 21

An Extension of the Mesabi Range of Minnesota, to the east, not shown on the U. S. Geological Survey maps, is noted by Geo. A. St. Clair, a mine owner of Duluth. This magnetic extension stretches from Township 60, Range 13, St. Louis County, to South Lake, in Cook County, a distance of 80 miles, where it crosses into Canada. It varies up to a mile in width as measured on the surface, but the available ores are low in grade, averaging 30 to 40%; scattered diamond drilling has shown a depth of 100 to 700 ft. Mr. St. Clair estimates several billion tons of this low-grade ore available for opencut mining, and believes that a sintering or metallizing process will be devised that will make the extraction profitable.

The Cuyuna Range Will Ship 2 500,000 Tons of Ore in 1914, compared with 1,000,000 tons this year as estimated by George H. Crosby of Duluth. The Pennington mine, which is being stripped by the operating company, Tod-Stambaugh & Co., will ship 100,000 tons this year, its initial year as a shipper, and should ship 500,000 tons next year. The Pittsburgh Steel Ore Co.'s mine on the Cuyuna range will, it now appears, make a small shipment this year, and a heavy shipment next year. This is a stripping proposition also. The Cuyuna-Duluth Iron company, which is about to inaugurate shipments from its Ironton shaft, will sink another shaft, on its Federal property, and will produce from two shafts during the coming winter for 1914 shipments. The Cuyuna-Mille Lacs mine, a producer of manganese ore, and of iron ore which carries a high average of manganese, will, it is expected, be shipping at the rate of 1000 tons per day by the

latter part of August. The ore production at present is about 500 tons per day. The Mangan Iron & Steel company reports high-grade iron ore at a depth of 130 ft. on its No. 2 property, at a distance of 300 ft. east of the regular drilling. It was on this property that high-grade iron ore was developed between 495 and 600 ft., a few weeks ago. Concentrators are to be established at the Thompson mine of the Inland Steel at Crosby, and at the Pittsburgh Steel Ore mine at Riverton. Ground will be broken for stripping the Thompson in a few days.

MARQUETTE—July 26

A Development Record has been established by Pickands, Mather & Co. at the Bengal mine at Iron River, Menominee range. Development work started only last autumn, the property has entered the list of shippers. Since the mine eventually will be one of the heaviest producers in the district, it is expensively equipped. All the buildings are of brick and steel, modern in every respect. The steel headframe is one of the largest on the range. It is 105 ft. high and is provided with a No. 7½ ore crusher. Pickands, Mather & Co. are shipping large tonnages from the Baltic and Caspian mines at Iron River. The Zimmerman property of the Spring Valley Mining Co. also is making a good record in this particular. But little work is in progress in the Michigamme district, at the western end of the Menominee range, although it was expected that there would be 200 men employed by this time; not more than 25 men are at work. The mines in the field are the Ohio and Portland of the Rogers-Brown interests and the Imperial of the Cleveland-Cliffs Iron Co. Extensive improvements have been made in the last year and the mines are in condition to operate on a larger scale than heretofore; but it appears there is small demand for the limonite ore produced in the district.

NEGAUNEE—July 24

Mine-Tax Protests Continue from mining companies, which believe that their properties are assessed too high. On the Marquette range the Jones & Laughlin agent has asked that the valuation of the famous old Lake Angeline mine be reduced from $450,000 to $100,000, stating that not over 100,000 tons of ore is left in the mine and that the cost of extraction is high. The Cleveland-Cliffs and Oliver companies recently made formal protests on valuations of their mines and will probably continue their objections later. At Ishpeming the Cleveland-Cliffs is assessed $2,925,000 on the Hard Ore and Lake mines, $2,316,000 on the Cliffs shafts, and $149,000 on the old Salisbury mine; the Oliver is assessed $3,645,000 on Sec. 16 mine and $894,000 on the old Lake Superior Hard Ore.

Payment of Employees Twice a Month, in accordance with the new state law, is being prepared for by the mining companies. The custom in the past has been to pay once a month, about the fifteenth or twentieth, for the previous month's labor. The new law also specifies that not more than 15 days shall elapse after a period of labor is completed before payment is made. The larger mining companies will probably pay between the tenth and the fifteenth and again between the twenty-fifth and thirtieth. This change in pay days will affect the letting of contracts in underground work, as these have been let by the month in the past except that contracts for drifting at a certain rate per foot and for stoping at a certain rate per car have been usually arranged by the mining captain.

LEAD—July 26

Taxation of Mining Properties has been a matter claiming the attention of Black Hills operators, since a decision was arrived at to place the valuation at a figure more nearly the actual worth. In the past the rule in this section has been to make the valuation at a low figure, but a state tax commission, created by the last legislature, has ordered large increases. The assessed valuation of the Homestake, typical of Black Hills properties, has been increased three-fold, and many items not previously listed, have been added. For instance bullion on hand on July 1 was listed at $125,000. Other properties have been increased in like proportion, and in some instances nonproductive property has been valued at an almost exorbitant figure. It is promised that the tax levy will be reduced far below former figures, so that the gross taxes paid will be about the same as formerly, but, as is always the case when a radical change is made in a system of taxation and an earnest effort put forth to ascertain the true value of taxable property, much dissatisfaction is expressed.

JOPLIN—July 26

Suit against Thomas Coyne, of Webb City, has been filed in the Joplin Federal court by the Consolidated Mines Selection Co., of London, which seeks to recover $133,000 from the vendor from whom it purchased the Mary C. mine at Thoms Station in 1912 for the highest sale price paid for a single mine in the district. The petition to the court alleges misrepresentation of the property and asserts that the value of the property really did not exceed $10,000. Amos D. Hatton, of Webb City, and E. St. George Noble, of Joplin, were also named in the petition as being parties in the alleged conspiracy to "sell the mine under fraudulent representations." According to the court petition the company paid $135,000 for the lease and mill. The Mary C. mine was at one time the greatest producer in the district and some record outputs were made. The sale was made to the corporation after several weeks of exhaustive examination by engineers in the employ of the buyers. The petition to the court alleges that the mine's ore was made to appear richer than it really was and that cracks on the surface indicating caving ground were filled with tailings to deceive the agents of the company. The suit will be tried at the January term of court.

The Passing of Sheet Ground Mining is the most prominent feature of change in the mining industry of Webb City, the month of July seeing the closing down of five of the largest and heretofore steadiest producers in the north Webb City camp. Their closing down is permanent as in most instances the ground is entirely cut out or all the ground that is worth working is gone. The previous month had noted the closing down of several properties in that field, and July shows a cut in the shipments of ores from that camp. From a record of 4,000,000 lb. per week and even as high as 6,000,000 lb. some weeks the decline has brought the weekly tonnage down to 3,000,000 lb. with the certainty of a further decline before the year ends. From first place as a producer of ore, Webb City may have to yield to Joplin within another year or two. Already several weeks have shown the Joplin output greater than that of Webb City, a condition that has not prevailed for a number of years previously. Two of the mining companies that have been mining in that field have changed their activities to other parts of the district and one of them, the Underwriters Land Co., has already developed a property in the Joplin camp that is rapidly taking the place of its former mines, the Golden Glow and the Yellow Dog mines at Webb City, in the tonnage of ore shipped each week. The new property is known as the Priscilla mine and is in what is termed the West Joplin sheet ground area. Besides this mine the company has drilled a large area and is now sinking two other shafts with the expectation of operating two more mills by the end of the year. It will be seen from this that the production lost at Webb City is being made up at Joplin. The Danglade companies are changing their operations to the Thoms Station camp and will augment their output from new mines in that field before the end of the year.

SPOKANE—July 22

The Erection of a Smelting Plant in the New Hazelton District, B. C., the feasibility of which is being investigated by engineering representatives of English capitalists, according to a statement attributed to F. C. McKinnon, will be advantageous to Spokane operators engaged in the development there of lead-silver and copper properties. Paying $11.50 per ton for the transportation and treatment of their ore, the Spokane operators anticipate a cut of 50% on these charges with a plant at hand. The English corporation has invested a large sum in the development of the Hudson Bay mine, on Hudson Bay Mountain, 30 miles south of New Hazelton. Favorably impressed with its earnestness, the Grand Trunk Pacific has sent engineers into the field to survey a route to the property.

CORDOVA, ALASKA—July 9

The Bering River Coal Test is being discussed by the people of southwestern Alaska because of the apparent failure of the government's expedition to bring out the 800 tons mined last year for experimental purposes. It seems that the "Maryland" which is now at the mouth of the Bering River will wait there for many months before the coal can be brought down. Dr. Downing, who is in charge of the expedition to bring the coal from Stillwater to open navigation, is still at the mouth of the Bering River with his $30,000 fleet of specially built lighters. He contemplates dredging a channel as the lighters draw more water than the depth of the river. Experienced mining men in this district say that if the Navy wanted the coal to make a steam test it could have been delivered and now waiting for the warship for less than half what the lighters cost. The opinion here is that Dr. Downing stands as much chance of getting the coal down the river this summer as a transportation man would have of taking the appendix from an army mule without the assistance of a veterinary. So far the 800 tons have cost the government $100,000 and the coal is still at the mines.

THE MINING NEWS

ALASKA

GOLD FROM NOME AND ST. MICHAELS was received at Seattle July 17, having been brought in on the S.S. "Senator," the shipment being worth about $700,000, and making the receipts at the Assay Office since July 1 more than $1,000,000, a gain over the same period of last year.

SHORTAGE OF WATER ON SEWARD PENINSULA is so serious that the output of gold for the year may be appreciably affected. In addition to this the frost last winter penetrated so deeply into the ground that it is thawing slowly, delaying the progress of the dredges; this condition prevails in all parts of the peninsula.

A STRIKE ON THE SUSHANNA was recently made and is causing much excitement, as it promises to develop into the most important discovery since the Klondike. It is reported that gravel containing from 75c. to $5 per pan is being washed and that two men using crude appliances washed out $2500 worth of gold in one day. Bedrock is found from 4 to 5 ft. below surface. Pay has also been found on Bonanza, Eldorado and other tributaries of the Sushanna River. Many prospectors are going to the district where laborers are now receiving $12 per day.

CONSTRUCTION OF TRAILS AND ROADS is desired by nearly every district in Alaska. Colonel Richardson, president of the Alaska road commission, states that requests for such trails and roads have been made to such an extent that an expenditure of $2,000,000 would have to be made to satisfy all the demands. These requests have been considered by the board consisting of Colonel Richardson, Lieutenant Edgerton and Lieutenant Weeks, and they have found them meritorious, but are unable to comply with the requests because of the lack of funds. Lieutenant Edgerton states that with an appropriation of $2,000,000 all the roads requested could be built and kept up for a period of three years. The work would cover only those roads that are justified by the development work done in the different camps.

ALASKA TREADWELL (Douglas)—In June 74,900 tons of ore yielded bullion and concentrate worth $208,407 or $2.81 per ton, $109,375 being the estimated net profit.

ALASKA MEXICAN (Douglas)—In June 18,207 tons of ore yielded $51,254 worth of bullion and concentrate, or at the rate of $2.84 per ton, $25,350 being the estimated net profit.

RAINBOW (Fairbanks)—The Straub mill, erected last winter, having proved unsatisfactory, it is planned to install a Joshua Hendy five-stamp battery. Negotiations are pending for the purchase of a battery from the Chena Milling, Smelting & Refining Co. This mill was built at Chena in 1910 to do custom work, but, owing to the high cost of transporting ore from the mines to the mill, it has been idle most of the time.

RUSH & BROWN (Kasaan)—Work on the winze to the third level has been delayed and has now been stopped at a depth of 56 ft., because of the nonarrival of a new boiler. Drifting and stoping is being continued on the second level from which 900 tons of ore have been broken from a new oreshoot and shipped to Tacoma.

ARIZONA

Cochise County

LEADVILLE (Courtland)—All the deals on this property that have been made by Fuller & Neer have been called off and the general manager, W. W. Holmes, is attending to all matters pertaining to the mine.

Gila County

MIAMI COPPER (Miami)—Excellent progress is being made in the work of reopening the northwest orebody affected by the April cave-in. The Captain shaft is rapidly being put in shape and the tramming level is being carried into that territory for extraction of Captain ore.

INSPIRATION CONSOLIDATED (Miami)—At the millsite considerable preliminary work is in progress, but the work of putting in concrete will not begin for a few weeks. Cement is arriving at the rate of one carload per day, and iron for reinforcement is being delivered at the concentrator site.

INSPIRATION EXTENSION (Miami)—The shaft has been started, the contract for the first 100 ft. having been awarded. The new development company's equipment consists of a 25-hp. gasoline hoist and accessories. A small compressor to run light drills will be installed in the near future. The shaft lies a short distance northwest of the main east and west shafts of the Inspiration Consolidated. The shaft has been started in schist of the same character as that found in Consolidated ground.

Mohave County

GOLD ROAD (Gold Road)—A recent weekly shipment of bullion from this property was valued at $20,000.

KEYSTONE (Mineral Park)—This property has been unwatered, and it is expected that sinking to the 500-ft. level will soon be started.

GOLCONDA (Golconda)—The timbering and enlarging of the shaft on this property has just been completed from the 400- to the 200-ft. level, and is progressing rapidly from the 200-ft. level to the surface. There is a large amount of ore on all the levels opened and also in the Prosperity tunnel. Within six weeks this property will probably resume shipments of its zinc ore to the Oklahoma smelters.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—The annual stockholders' meeting of this company was recently held. At the same time the mill was started for a preliminary trial of the machinery. Due to defects in the concrete work, it was found that the foundations of the concentrating tables and crushers would have to be replaced. This work is progressing rapidly. The steel headframe is at Yucca awaiting shipment to the mine, and an electric hoist and large compressor are being installed at the main shaft.

NEVADA-ARIZONA MINES CO. (Hackberry)—This company is endeavoring to bring its property in the Music Mountains to the producing stage at the earliest possible date. Due to the long drought this year, there is a shortage of water for milling, but it is expected that a sufficient supply for all purposes can be developed. A large block of ore is in sight on the Lucknow and Roosevelt claims. The stope in the Roosevelt tunnel shows 3 ft. of good milling ore. Samples of this ore will be shipped to Denver and Los Angeles for mill tests, and a cyanide test will be made by R. C. Jacobson, of Kingman. The mill is nearly completed.

Pinal County

CALUMET & ARIZONA (Superior)—The shaft is now more than 500 ft. deep, and is making about 6000 gal. of water per 24 hr. A pump station is being cut at the 500-ft. level and a pump will be installed. The main working tunnel is about 1000 ft. long, and stringers of carbonate and sulphide ore have been passed through. A 15-drill compressor may be installed in the near future. Thomas Ryan, diamond-drill contractor, who has been drilling the Magma property for several months, may drill 1500 ft. on the property.

MAGMA COPPER CO. (Superior)—Because of the large amount of water and comparatively small amount of power available, work has been held back during the last few months, but such work as has been done has been satisfactory, and there is now an excellent showing of ore in both the 650- and 800-ft. levels east. When the power line from Roosevelt via Miami is completed the Magma will have ample power and development work will proceed more rapidly, and within the next few months construction of a concentrator will begin. It is said that the company will begin purchasing mill equipment within 60 days. Considerable equipment has already been ordered to be delivered at the mine to be installed in time to begin operation when the transmission line is completed. Three transformers for the substation to reduce from 45,000 to 2200 volts, three transformers to reduce the voltage from 2200 to 440 for the mine pumps, three vertical Aldrich pumps to be driven by 75-hp. motors, a 225-hp. motor to drive the compressors, and considerable auxiliary machinery, has been ordered. The Magma is shipping the usual amount of high-grade copper ore to Florence by team, thence by rail to the El Paso smelters. About 500 ft. of diamond drilling remains to be done by contract. Ore has been encountered in all of the holes drilled.

CALIFORNIA

San Francisco

"BORAX SMITH" may be declared an involuntary bankrupt, four creditors with claims amounting to $155,000 having filed a petition in the federal court at San Francisco. The petition declared that prior to May 5, when a committee was appointed to act as trustees in managing F. M. Smith's affairs, he conveyed without money consideration properties valued at $1,000,000 to the Mercantile Trust Co., to B. F. Edwards, and to his wife, at a time when he was insolvent. These transfers, the complaint alleged, constituted acts in bankruptcy.

Amador County

CENTRAL EUREKA (Sutter Creek)—An assessment of 2½c. per share on the capital stock has been levied.

LITTLE ILLINOIS—Good ore disclosed in the west vein has induced the company to arrange for the installation of a new 10-stamp mill.

GRILLO (Volcano)—Twenty men are employed at this gravel mine, and are taking out an average of $300 per day. The channel is a recent discovery. The mine is being worked by Grillo Brothers, but it is bonded to San Francisco men at the purchase price of $8000. One-half the amount was paid on July 1. The formation is a capped river channel and is close to the town of Volcano.

Calaveras County .

DOLLING (Angels)—The mine is being unwatered and preparations made for resumption of mining and milling. This mine for a time kept a 40-stamp mill in operation. The mill was closed down last year and development of new orebodies undertaken. Good ore was found in a winze sunk from the 400-ft. level and another good vein was also found in a drift from the same level. Some difficulty other than lack of ore development caused the mine to close down during which time it has made a large amount of water.

Modoc County

HESS (Adin)—The new 10-stamp mill is completed and the stamps will begin dropping immediately. A large tonnage of $5 ore has been blocked out.

Nevada County

ZEIBRIGHT (Towle)—A new drift will be driven about 350 ft. above the present tunnel workings. The mill will be partly rebuilt this summer.

ARCTIC (Washington)—A new concrete power house is being built and a 600-kw. turbine will be installed. A 5-ton motor truck is used to transport material from Emigrant Gap, 20 miles distant.

GASTON (Gaston)—The timbers that are to be used in building the new mill are now being sawed at the sawmill. The new mill will be 1500 ft. lower than the present mill, and 10 stamps of the old 40-stamp mill equipment will be used in the new mill.

OUSTOMAH (Nevada City)—New electric equipment and a new compresor have been installed. Four stopes are being worked, the ore containing heavy sulphides. The mill was started July 6. The shaft is 1050 ft. deep and will be sunk to 1500 ft. to get under the oreshoots. An 8-in. piston pump on the 600-ft. level and a 9-in. bucket pump on the 900 are used for drainage.

Plumas County

IN THE NELSON DISTRICT, placer mining has been temporarily suspended at some of the mines owing to a shortage of water.

Tuolumne County

BLACK OAK (Soulsbyville)—The trial of the suit to determine the rate of interest to be paid by Charles T. Knox, who purchased and developed the mine, was begun in the Superior Court at Stockton, July 17.

COLORADO

Clear Creek County

TERRIBLE—A force of 25 men is employed in cleaning out, repairing and retimbering the lower levels of this mine, preparatory to the resumption of active operations.

MORNING STAR (Ames)—Recent development by this company has been encouraging. The Sunlight vein is being developed by a drift driven with air drills. The compressor plant is operated by water power. The Morning Star and Sunshine lodes have been leased for a period of two years. The lessees will commence operations on these veins in the near future.

Conejos County

FROM THE PLATORO DISTRICT a shipment of a 10-ton lot of rich ore from the Miser tunnel has been sent to the Pueblo smelting plant. The Miser mine is the property of the Guadaloupe Consolidated Mining Co.

Gilpin County

SECURITY PLACER (Black Hawk)—A steam shovel capable of digging 1000 cu.yd. per day is to be installed on these properties on which John Cantlon and C. K. Berryman have a three-years lease.

Lake County

MACHINERY AT THE ARKANSAS VALLEY WORKS is now largely operated electrically and the Colorado Power Co. is building a new line from the substation in California gulch to the plant.

THE EXTENSION OF THE GOLD BELT, it is reported from Leadville, is being proved up as far as Red Mountain, 6 miles south of the Mt. Champion group, by prospectors who are working in great numbers over the low divide between Lackawanna Gulch and Hayden Gulch and Echo Cañon, where new discoveries have recently been made. The Fidelity mine on Bull Hill is said to be proving one of the richest mines in the district.

STARS CONSOLIDATED MINING CO. (Leadville) — The Morning and Evening Star groups operating under the foregoing company name are paying monthly dividends, the output being nearly 4000 tons per month, chiefly carbonate of zinc carrying silver.

San Juan Region

FRISCO TUNNEL CO. (Animas Forks)—An important strike of rich, silver-bearing, gray copper ore has been made in the Red Cloud vein in the Bagley tunnel 900 ft. below the outcrop.

Summit County

WELLINGTON (Breckenridge)—In the half yearly financial statement which accompanied the July dividend of $50,000, the directors state that the wet mill will remain shut down till the price of zinc ore warrants its further operation. The No. 2 mill or magnetic separator is treating the "middlings" made by the wet mill prior to the closing down, and three carloads of concentrates were recently shipped. From Dec. 1, 1912 to May 1, 1913 the company sold $164,868 worth of ore.

Teller County

CRIPPLE CREEK DIVIDENDS in July include $60,000 declared by the Portland, $30,000 by the Golden Cycle, $45,000 by the Vindicator and $26,800 by the Mary McKinney. The Elkton will pay its usual quarterly dividend of $50,000 in August.

FREE COINAGE (Altman)—The new mill of 50 tons daily capacity is being built and will be ready for operation in about 90 days.

MIDGET-BONANZA (Cripple Creek)—The Beckof Leasing Co., of St. Louis, of which J. Dopke is president and William Allen, superintendent, has taken the Midget shaft under lease and will develop the property extensively, and lease to local men. The mine is on Gold Hill.

AJAX (Victor)—The mill, known as the Colburn mill, is now running satisfactorily and treating about 250 tons per day, part being from the dump and the rest mill dirt from the mine where the company is working two machines in ore. The lessees will now produce about four carloads per day and the July output will show an increase over June.

IDAHO

Cœur d'Alene District

GREEN HILL-CLEVELAND VS. HEADLIGHT—The Green Hill-Cleveland Co. is seeking an injunction to prevent the Headlight company from doing further work on the plaintiffs' ground; the right to survey the Headlight workings is also asked.

NATIONAL (Mullan)—Tests are being made on the ore in order that a flowsheet for a 500-ton concentrator may be drawn. As soon as this work is completed building the mill will be started. A tramway one mile in length is being planned to carry the ore from the mine to the mill.

FRISCO (Gem)—The mine after several months of work, has been unwatered and is now about in condition for resumption of mining. Although the mine has been idle since 1908, the timbers were found to be in good condition. As soon as the drifts are cleaned development work will be started.

HYPOTHEEK (Kingston)—Development work is now confined to the 700-ft. level, where good ore is being encountered. The 40-ton mill is working at capacity and is producing 6 tons of lead concentrates daily. It is now planned to electrify the hoist and build a large reservoir for mill water.

BLACK BEAR (Black Bear)—The ore in the raise from the No. 3 tunnel is found to be of better grade as the work progresses and the vein is found to widen. The raise now shows 2½ ft. of solid lead-zinc ore. In the raise from the No. 2 tunnel there is 6 ft. of stoping ore. A total of more than 5000 ft. of work has been done on the property of which 2500 ft. is a crosscut and 1200 ft. a drift on the vein. The face of the drift is 2000 ft. below the surface; ore has been encountered 1200 ft. higher up. A winze is being sunk to meet the raise from the lower tunnel. The vein is 25 ft. wide where it has been crosscut, and it carries some exceptionally rich zinc ore.

REX MINING CO. (Wallace)—Spokane stockholders in this company, which owns the Rex mine, formerly called the Sixteen to One, on Nine-Mile Creek, have submitted a proposition to the other shareholders to subscribe a fund of $30,000, as a loan to the company to finance continuation of development of the property, which has been closed since the leasing company suspended operations about six months ago. The notice of the proposal states that many of the stockholders favor a continuation of development where the lessees quit and elsewhere in the mine. There is no ore in sight and little money in the treasury, and it has been suggested that the stockholders voluntarily contribute enough to sink the main shaft as much deeper as the directors deem advisable, and to do considerable crosscutting. It is estimated that this work will require about $30,000. Accompanying the announcement is a call for the annual meeting, which was appointed to be held at Augusta, Maine, Aug. 1, where plans were to be formulated to develop the mine further or to dismantle it.

MICHIGAN

Iron

ERIE ORE CO. (Randville)—The Erie Ore Co., which succeeded to the holdings of the Groveland Mining Co., in the Randville district, is employing about 30 men in test-pitting, trenching and surface exploratory work. Some ore has been located close to the surface but it is of low grade and it would not pay to mine it unless it could be taken out with steam shovels. The Breitung company has some lands adjoining that they explored several years ago; the ore located was low in grade but may be used at a later date.

MINNESOTA

Cuyuna Range

NEW DOCKS AT DULUTH and new grain elevators to cost $2,000,000 will, it is reported, be built by the Canadian Northern Ry. One of the docks will be designed to ship iron ore. Sooner or later the Canadian Northern will be handling some iron ore, for the main line to Duluth crosses the Mesabi range, and it is expected that the company will extend its branch from Port Arthur across the Vermilion to a connection with the main line. This road will be completed between Montreal and Vancouver within 12 months, and after that is accomplished the company will give more attention to feeders.

JONES & LAUGHLIN (Crosby)—This company has leased an iron property near the Pennington mine, which is now being stripped, and it is expected that the newly acquired mine will also be stripped.

Mesabi Range

KELLOGG (Virginia)—This mine controlled by the Tesora Mining Co., of which Capt. M. L. Fay, of Duluth is president, has delivered a lease of the property to Pickands, Mather & Co. The lease runs for 14 years, and the minimum royalty is $350,000 per year. The royalty is $1 per ton, and the ore is a fine grade of Bessemer, of good structure and uniform. The lease formerly was held by the New York State Steel Co., but that company abandoned it last April.

MISSOURI

Joplin District

YELLOW DOG (Webb City)—This once famous mill is being dismantled to be erected by the Comanche Mining Co. on a 20-acre lease of the Center Creek Mining Co.

AGENT (Carthage)—C. C. Playter & Co., of Joplin, has made its initial output from this mine, after many weeks spent at draining the property. It formerly was known as the Cornell, and is on the Sampson land.

ELENITA MINING CO. (Galena)—Deeper mining is to be done by this company, which plans to sink its shaft to a depth of 165 ft. There is said to be some good ore in the upper workings, which will be mined while sinking continues.

LOCKPORT (Galena)—A record production of zinc ore with a horse-hoisting outfit was made in a recent week by Murphy & Bramble, who sold more than $3000 worth of ore. The ore now averages about 10% and carries some lead.

GRAY (Joplin)—Construction work on a 200-ton mill has been begun by A. F. Dexter & Co., which has a 16-ft. face of zinc ore in two drifts at a depth of 160 ft. Several drill holes were put down and ore is said to have been found in each.

MORGAN & CO. (Joplin)—Silicate that is bringing top market prices is being mined by this company at 44 ft. Large chunks of the ore, encrusted with galena and blende, have been taken out. The land is owned by E. G. Doane & Son, of Joplin.

YOUNG & SERGEANT (Galena)—This company is conducting a drilling campaign, with expectations of finding zinc at a depth of about 100 ft. One of the holes is near the Scarlet Kid mine, the largest operating plant on the ground, known as the Foster tract.

GRASSELLI CHEMICAL CO. (Stotts City)—It is reported that two drills are being used in prospecting a large acreage in this old camp. The advent of this company in the Stotts City camp has caused the entrance of four other drills and the prospecting will cover a large acreage of virgin territory.

ARCO (Joplin)—This company has just started its new mill on a 23-acre lease of the Connor land, in the western part of the district, after a shutdown to permit drilling for water. A hole was put down in the shaft and water was encountered. According to D. M. Sayers, manager, an extensive orebody is available.

CHAPMAN & DODGE (Webb City)—The Wyatt mines, on the Dixon land, at Thomas Station, were recently purchased, but according to the contracts of sale the purchasers will wait a stipulated time before taking charge. Good lead ore is being hoisted, but the new owners will mine in the lower levels. The Captain E. mine is on the same tract and is producing both zinc and lead.

SCHIFFERDECKER LAND (Joplin)—The well known 400-acre tract east of Joplin, owned by Charles Schifferdecker, has been leased by W. G. Stevens and the tenth drill hole is now being sunk. The results of the drilling insure the early sinking of two shafts for the development of zinc ore while in nearly every hole put down shallow lead ore was found. The shallow deposits will be subleased to small operators which will probably result in a large lead-ore production by early autumn.

BIG IRISHMAN (Thoms Station)—Weekly turn-ins now are being made at this mine, a new plant having been placed in operation only a short time ago. It is owned by H. C. Moses, Victor Grieb, Frank Logan, Caro Stewart and Frank Williams, of Carthage, and two Kansas City men. A tramway is to be erected from the east shaft to the mill, in order that the ore may be sent direct to the concentrating plant. The mineral extends from the 126-ft. level to the 155-ft. level. The roof of the present drift is at the 126-ft. level, and a high mill recovery is made on ore from the main shafts. Ten days' operation of the plant produced two carloads of blende and 20,000 lb. of galena.

MONTANA

Butte District

GENEVIEVE (Butte)—The Butte & Great Falls Mining Co. which is operating this claim at the head of Dixie Gulch, three miles north of Butte, has sunk a shaft to the 200-ft. level and is now cutting a sump preparatory to crosscutting at this depth. It is believed that the Genevieve vein, which outcrops on the surface, will be reached 40 ft. from the shaft. A steam hoist capable of sinking to a depth of 500 ft. has been installed, and a two-drill air-compressor is being used.

COLORADO (Butte)—The Davis-Daly company operating this property in the southern part of the Butte district, sustained a loss of $88,939 during the year ended June 1. Up to the last few months, however, the company has shipped practically no ore, but has been under a heavy expense in doing development work. Good ore was struck a few months ago and regular shipments have been made since then, the amount having been gradually increased until at present an average of more than 200 tons of ore is being mined and shipped daily.

EAST BUTTE (Butte)—A production of about 2,225,000 lb. of copper per month is being maintained in spite of the improvements being made to the smelting plant. These improvements will be completed in about another month and then the company will be in a position to increase the production if necessary by at least 500,000 lb. per month. The development work is being done on an extensive scale and the ore reserves are considerably larger now than at any time in the history of the property.

NORTH BUTTE (Butte)—In sinking the Granite Mountain shaft the 2500-ft. point has been passed and at the present rate of progress it is estimated that a depth of 2800 ft. will be reached by the middle of October. Then a sump will be sunk and connection made with the 2800-ft. level of the Speculator shaft. It has not yet been determined when the Speculator shaft will be closed for retimbering and all the ore hoisted through the Granite Mountain shaft, but it is believed that the Speculator shaft will be operated as long as it remains in a perfectly safe condition.

LEXINGTON (Butte)—It has been reported that John D. Ryan and Eastern men are preparing to reopen this mine, the work to begin probably in August. The mine was formerly owned by the La France Copper Co. but was sold to Eastern men several months ago at sheriff's sale. The work of obtaining title to certain of the claims and fractions has been completed and the new owners are now free to proceed. The mine was worked originally for silver, but the lower levels contain large shoots of zinc ore, and with the improved appliances now in use for the recovery of zinc, the mine should again become a producer.

Missoula County

IRON MOUNTAIN (Missoula)—It is reported that a fine body of ore has been opened and it is said that before another month the company will not only be making operating expenses but will also be putting some money into the treasury. Since the installation of the electric plant the company has been able to reduce operating expenses.

NEVADA

Comstock Lode

CALEDONIA (Virginia City)—The new 75-hp. Fairbanks-Morse hoisting motor has been installed at the New York shaft, which is now being repaired, preparatory to opening the old workings to gain a working course through to the Caledonia mine adjoining.

MONTE CRISTO (Virginia City)—Milling of ore has been resumed at this property under lease to the Mexican company, and shipments are being made to the Mexican mill and to the mill at the Monte Cristo mine. It is planned to maintain a daily shipment of 125 tons.

SUTRO TUNNEL (Virginia City)—Work will soon be started on the drainway in the south lateral tunnel from the Ward shaft connection to the Crown Point drift, to be used when the pumps are installed in the joint incline in the Sturges group of mines in Gold Hill. It is planned to start pumping early in the autumn in that section to unwater the Crown Point, Belcher and Yellow Jacket mines to the 1800-ft. level.

WEST COMSTOCK MINING & LEASING CO. (Virginia City)—Los Angeles men interested in this company, operating on the Golden Gate claims at Jumbo, five miles from Virginia City, paid a visit to that camp recently. From a shaft on the Golden Gate claim, an east crosscut on the 200-ft. level, has encountered a vein, 25 ft. wide. Driving north and south on the vein has shown milling-grade ore, and 500 tons has been mined. Work has been stopped at the Syene shaft of the company, and all work will be concentrated on the Golden Gate oreshoot. It is reported that a mill will be built if further development work justifies it. Pumps have been placed in the Golden Gate shaft to care for a flow of water that appeared upon cutting the vein.

Humboldt County

A GOLD STRIKE has been made in Sacramento cañon, near Rochester. The oreshoot is flat, wide, and assays $7.50 over the entire width.

NEVADA SHORT LINE R.R. (Rochester)—A 6-cylinder, 60-hp. gasoline motor has been ordered for this road. Dump cars and flat cars have already been delivered.

EASTERN STAR (Gold Circle)—The shaft, which is sunk in the hanging wall, is now down 270 ft. It is equipped with a cornish pump of 500 ft. capacity. Drifting north and south on both the second and third levels is in progress. The oreshoot is 6 to 8 ft. wide and the ore is of good milling grade. On the second level narrow quartz stringers show free gold, silver and argentite. A shipment of ore will be made in order to determine the best treatment process, the directors having decided to erect a mill this summer. The mine is now making enough water to supply 20 stamps. A 10-stamp unit will be erected first, with a tube mill for regrinding, and a cyanide plant.

Lyon County

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended July 17, 1913, were as follows: From Mason Valley Mines Co., 1930 tons; from Nevada-Douglas, 1132 tons; from other mines, 1299 tons; total, 4361, or a daily average of 623 tons. During the same week six cars of matte were shipped.

NEVADA-DOUGLAS COPPER CO. (Ludwig)—This company will trade its 5000 shares in the Nevada Copper Belt R.R. to shareholders of the Nevada-Douglas Copper Co., at the rate of one share of railroad stock for 10 shares of the mining stock. The railroad bonds, which the company held, have been sold at par. The reason given for this exchange is that laws already existing and which may be enacted make this exchange desirable, also to place the company above any criticism, either public or private, for holding stock in a railroad.

Mineral County

AURORA (Hudson)—Work on the 40-stamp mill is being hastened as much as possible by the Hughes Construction Co. Auto tracks and teams are hauling the supplies from Hudson, the nearest railroad point.

Nye County

JUMPING JACK (Manhattan)—A recent mill test has proved the ore to be of commercial grade if treated on a large scale. A large tonnage of ore is available.

MANHATTAN-DEXTER (Manhattan)—A No. 8 Cameron sinking pump has been lowered to water level in the 500-ft. working shaft and unwatering of the main workings has begun. After this is completed a Goulds pump will be installed and mining on the lower levels will commence.

TONOPAH NORTH STAR (Tonopah)—Stock certificates of this company have been forged and tampered with by clever forgers operating in New York, certificates for 100 shares were raised to 1000 shares and in other cases the shares were reproduced at their face value. It is said that New York brokers were caught for 20,000 shares. The company maintains no transfer office in New York and transfers are delayed because of the time required for certificates to reach Eastern purchasers from the San Francisco office; this facilitated the forgeries. A messenger sent to deliver a check to C. J. Wells, in whose name the forged securities were sold, was accompanied by a detective; they met a man who took the check, who proving quicker witted than the detective, escaped in a taxi. The directors have now agreed to transfer all shares free of charge until Sept. 1, in order to permit all certificates to pass through the office for examination.

NEW MEXICO

Grant County

SAVANNA COPPER (Pinas Altos)—Joe Franton, working a sublease from Bell & Wright, lessees on the Savanna property near Pinas Altos, struck some high-grade ore and cleaned up $10,000 from shipments to El Paso during the last four weeks.

UTAH

Beaver County

MAJESTIC (Milford)—A shaft is to be sunk on the Hoosier Boy claims belonging to this company. It will be sunk to a depth of 200 ft., then crosscutting will be started to get under old workings, in the past productive of silver ore. The shaft will ultimately be sunk to a depth of 500 ft. For some time the company has been making shipments of copper ore from the Old Hickory, averaging 75 tons daily.

MOSCOW (Moscow)—The sinking of a new two-compartment shaft has been started about 1600 ft. northeast of the present working shaft. The shaft is to reach a depth of 1000 ft., and will open ground into which oreshoots opened in old workings appear to extend on their dip. The ore has been followed almost to the 800-ft. level, and is found to be richer at depth. The Mammoth vein will be cut at 300 or 400 ft., and another vein is looked for at 500 ft. The new shaft will be about 5 miles from Labo station, reducing the wagon haul by 3 miles.

Juab County

TINTIC SHIPMENTS for the week ended July 18, were 157 cars.

EAGLE & BLUE BELL (Eureka)—This company is reported to be acquiring a controlling interest in the Victoria Consolidated.

IRON BLOSSOM (Eureka)—The recently declared dividend of $100,000 will be paid July 25. After payment, there will be, it is stated, $300,000 still in the treasury. The dividend rate is being maintained from ore shipments; nineteen cars were shipped the week ended July 18. An ore-bearing fissure paralleling the main fissure has been opened recently, and ore followed for 20 ft. The ore is silver-lead of good grade.

Salt Lake County

A CLOUDBURST IN LOWER BINGHAM, July 23, was followed by a flood, which wrecked several houses, but in which no life was lost. The track of the Bingham & Garfield Ry. was damaged and traffic was delayed for 24 hours.

OHIO COPPER (Bingham)—Two members have been added to the executive committee, making five in all, and including all of the New York directors. The grade of the ore mined is stated to have improved lately.

Tooele County

INTERNATIONAL SMELTING & REFINING CO. (Tooele)—Three reverberatory furnaces at the Tooele plant are in blast, with four blast furnaces in operation at the lead plant also. A fifth lead furnace will be ready for operation in about 30 days.

WASHINGTON

Ferry County

KNOB HILL (Republic)—Further development has been planned for this property, reported to be one of the most profitable in the district.

SAN POIL CONSOLIDATED (Republic)—The corliss engine and other equipment recently installed at this mine are now in operation, greatly increasing the output.

Stevens County

FAITHFUL-SURPRISE (Danville)—The Harper Consolidated Mines has taken an option on this property. Regular daily shipments are being made.

KNOB HILL (Republic)—Determination to build a financial reserve, which may reach $50,000 or $100,000, has been reached by the directors of the Knob Hill company. In addition to the high-grade shoot, which has been yielding a carload a week of ore averaging $100 net in gold per ton, the company would open for large yield the bodies of milling ore exposed on the three existing levels. The campaign for additional resources contemplates a descent by shaft for 500 ft. below the main tunnel level.

WISCONSIN

Platteville District

THE LARGE PRODUCERS of the district are: The East End with an output of 900 tons of concentrates per month; Winskill, 800 tons; Fields, 850 tons; Kennedy, 720; Cleveland, 630; Frontier, 555; Vinegar Hill, 360; Northwestern, 377; Federal, 300, and Fox, 272 tons. The output of pyrites now runs from 2500 to 3000 tons per month, which goes to the acid plants near Chicago.

SPENSELY (Benton)—This mine is being unwatered with new pumping equipment.

JUG HANDLE (Shullsburg)—The open cut of this mine is being reworked for drybone.

LAWRENCE (Hazel Green)—The shaft is completed and now a new mill and power plant are to be built on the property.

RUISBECK (Cuba)—This, one of the earliest of the sheet ground mines, has been abandoned after 20 years of almost continuous operation.

SCRABBLE CREEK (Hazel Green)—The Cleveland company is operating this mine under lease, milling the ore in its mill which is on adjoining property.

MINERAL POINT ZINC CO. (Galena)—This company, the largest one operating in the district, is to move from Mineral Point to Galena at the south end of the district, where its largest producers are situated, including the old Black Jack which was recently acquired.

CANADA

British Columbia

STAR (Sandon)—This mine is shipping about a carload a week of high-grade silver-lead ore. Extensive development is going on for the purpose of opening up the orebody at deeper levels.

BRADSHAW—Work is proceeding on these claims and others near Hedley in the Similkameen, which were recently bonded by shareholders in the Nickel Plate. Three diamond drills are working continuously.

RED POINT AND RACE HORSE—These groups, 22 miles up the Kitsault River from Alice Arm in the Portland Canal district, have been bonded recently for the sum of $101,000, by T. F. Hopkins, of Seattle, who is said to represent Butte interests. The ore is a chalcopyrite, on the Red Point assaying from $2.50 to $11 per ton, and on the Race Horse from a few dollars up to $53 in gold, silver and copper as reported.

PORTLAND CANAL TUNNELS, LTD.—The tunnel being driven to tap the Glacier Creek vein series at depth is now in over 1500 ft. The drilling has been hard recently owing to the greenstones being silicified and mineralized with iron pyrite. It is probable, according to General Manager Elmendorf, that the face of the tunnel is approaching the contact with the Bitter Creek argillites. The average progress is more than 50 ft. per week. The vein series should be reached in another 500 ft. At present there are 24 men on the payroll.

Ontario

RIGHT OF WAY (Cobalt)—The charter affecting this property, which was recently surrendered, was not the charter of the Right of Way Mines, Ltd., the present owners, but that of the old Right of Way Mining Co., Ltd., which was taken over by them four years ago.

WETTLAUFER (Silver Center)—A financial statement shows cash on hand on July 11, of $158,631, and silver in transit or at the mine of an estimated value of $60,000, making a total of $218,631. Development has not been satisfactory and a contract has been let for diamond drilling in the hope of picking up new veins.

NORTHERN CUSTOMS CONCENTRATOR (Cobalt)—This mill has been purchased by the group of Englishmen operating the Cobalt-Townsite, Casey Cobalt, and other mines, at a price stated to be $250,000. They take over the property Nov. 1. The Northern Customs Concentrator, Ltd., will build another 100-stamp mill as soon as possible.

DOME (South Porcupine)—The new water line to Porcupine Lake has been completed and arrangements have been made whereby the township may obtain water for fire-fighting purposes if necessary. During the month of June, the greatest monthly tonnage yet obtained was put through the mill and a new low record was established for costs.

SILVER CLIFF (Cobalt)—The Orion Realty & Investment Co., which is operating this mine, issued 65 pay checks for last month's wages to its employees. When presented for payment it was found that there were no funds. One of the men took out a warrant of attachment against the company under which a carload of concentrates valued at $11,000 was seized.

JUPITER (Aura Lake)—At the annual meeting June 26, it was shown that the Drummonds, of Montreal, paid $300,000 cash and 500,000 shares of stock for the property. In addition, there has been expended a total of $203,157. The balance sheet shows $40,841 cash on hand and 157,214 unissued shares in the treasury. These shares will be issued to meet the cost of the mill. On the main vein, there is an oreshoot 300 ft. long on the 300-ft. level. It is expected to mill about $15. No work is being done on the other vein at present.

MEXICO

Sonora

W. G. WOLF WAS KILLED, July 16, near the Creston-Colorado property, by Mexican outlaws. He was a mining engineer whose home was in El Paso, Texas.

MINNEAPOLIS COPPER CO. (Cumpas)—Another car of copper matte has been shipped to the Copper Queen plant and a car of high-grade crude ore is on the way.

TRANSVAAL COPPER CO. (Cumpas)—Work has been suspended for the time being until a deal that is now pending can be straightened out; then development will be continued.

SAN DIEGO (Nacozari)—J. M. Archuleta the owner has sunk a shaft 30 ft. to develop the vein which has increased from 6 to 18 in. of shipping ore; a carload of the ore is ready for shipment.

EL TEMBLOR (Esqueda)—W. L. Rynerson, who is operating under lease, has opened new ore in the hanging wall. The new vein ranges from 12 in. to 2 ft. in width and the ore is of much better grade than that which he has been working. This will about double his present output.

SOUTH AFRICA

THE RAND STRIKE SITUATION threatens the closing of all the mines of the Rand, states a cable from London to the "Sun." The Federation of Trades has elected a secret strike committee with power to issue absolute orders. This committee has a scheme for a "scientific strike," that is, to start a strike at some distant place where there are no troops and few police, or to have damage done at a score of places simultaneously. Nothing more may be done for weeks, but the government will be put to continuous expense in safeguarding property in the meantime. Householders are laying in provisions and trade is stagnant. Merchants are ordering shipments of goods stopped. The police have found considerable seditious literature in the native tongue among the natives which refers to trouble breaking out among the "white tribes." The government mining authorities have completed a plan for marching off all the native laborers in the Rand, numbering 250,000, in case of a strike. They also suggest that in case of a strike no attempt be made to work the mines with strike breakers, but that the whole industry be practically shut down.

THE MARKET REPORT

METAL MARKETS

NEW YORK—July 30

The metal markets have shown more strength, but close disturbed and excited. Tin has been active and irregular.

Copper, Tin, Lead and Zinc

Copper—Since our last report the market has experienced a sharp advance but this has not been quite so extensive as has been reported by the daily papers, which have reflected what producers have asked and would like to get rather than what they have got. Sales of electrolytic copper have been made up to 15c., delivered, usual terms, but all through the week there has been a rather wide range of price, some of the agencies having been cheaper sellers than others. Also certain of the small producers and some dealers have been cheap sellers throughout, apparently having had no great confidence in the advance and being desirous of realizing. The relapse in the London market on July 29, which is ascribed partly to bear sales and partly to realizing sales, also had a weakening effect. Since then first-hands have been offering copper at 14⅞@14¾c. delivered, usual terms, although the largest agencies have maintained their last price of 15c. The transactions of the week attained a fairly large volume, but not so large as in the previous week. They were made chiefly with European buyers, domestic buyers not yet having figured in the market to any great extent. Their continued abstention is considered to be a source of underlying strength. As an interesting side light upon the business, it is reported that American buyers, who have the option of several alternatives in settling for their purchases, ½% discount for cash, 30 days' time for payment, or allowance upon unexpired time at the rate of 6% per annum, have lately been to a considerable extent choosing the alternative of the full time allowed under the usual terms. This has caused some of the agencies to be more interested in the European sales than in American, in view of the present high rates for money.

But relatively little business in Lake copper has been reported to us. Such as we have heard of has been scarcely more than of a retail character. It is difficult to quote what is the real Lake market. We quote 15c., net cash, New York, than which it certainly is not higher, but this quotation is more or less nominal. In consequence of the strike the Lake companies have not been offering copper in any large way.

As a result of the buying movement of the last two weeks, producers are now comfortably booked for the next 60 days. In view of the small stocks on hand and the strike at the Lake Superior mines, which continues, the position of the metal is an exceedingly strong one. At the close, the market has fallen off somewhat, due to the reaction in standard copper, and Lake is quoted nominally 15c.; electrolytic in cakes, wirebars or ingots 14.60@14.80c.; casting copper is quoted nominally at 14.30@14.35c. as an average for the week.

The London market for standard copper was £65 10s. for spot and £65 12s. 6d. for three months on July 24, and it jumped £1 to £66 11s. 3d. and £66 12s. 6d. respectively, on July 25. On July 28, under large transactions, it advanced further, to £67 7s. 6d. for spot and £67 5s. for three months. On July 29, however, under realizing sales and some bear sales, the market dropped back to £65 15s. for spot and three months. It closes on July 30 at £66 for both positions.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 7388 long tons. Our special correspondent gives the exports from Baltimore at 2796 tons for the week.

Tin—The Far Eastern interests, which of late had not been very aggressive, appeared as fairly large sellers the latter part of last week. This had an unfavorable effect on the London market, which declined easily. Good orders from this side and prospects of an improvement in the American statistics helped the market this week and prices again became firm. Transactions in this market were on a satisfactory scale, but mostly for July delivery, in anticipation of the favorable statistics. On July 30, the market had one of its inexplicable abrupt declines, and closes weak at £180 for both spot and three months, and about 39⅝c. for August tin here.

Shipments of tin from the Straits for July were 5200 long tons, making total of 35,930 tons for the seven months ended July 31. This is an increase of 2864 tons over last year.

Lead—The market has been active and strong. The producers having taken considerable business, prices advanced on Tuesday, July 29, to 4.50c. New York, and 4.35c. St. Louis, at which they remain at the close. There is talk of a strike among the mines of southeastern Missouri.

The London market, due to the continued scarcity of supplies from Mexico, is very firm, and during the week it was as high as £21 5s. It closes at £21 for Spanish lead and £21 10s. for English.

Spelter—There has been a good demand, which has not been freely met. Higher prices have been paid, and at the close St. Louis is quoted at 5.25@5.30c.; New York, 5.40@

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St Louis, Cts. per lb.
			14½	14.25			4.20	5 25	5.10
24	4.8675	59⅛	@14⅝	@14.35	40¾	4.35	@4.22½	@5.30	@5.15
			14⅝	14.30			4.25	5.27½	5.12½
25	4.8675	59	@15	@14.35	40¼	4.35	@4.27½	@5.32½	@5.17½
			14½	14.55			4.25	5.30	5.15
26	4.8675	59⅛	@15	@14.65	40¼	4.35	@4.27½	@5 35	@5.20
				14.70			4.25	5 35	5.20
28	4.8675	59⅜	15	@14.80	40⅝	4.35	@4.27½	@5.40	@5.25
				14.60			5.35	5 20	
29	4.8665	59⅜	15	@14.80	40¾	4.50	4.35	@5.45	@5.30
				14.60			5.40	5 25	
30	4.8650	59⅜	15	@14.80	39⅝	4.50	4.35	@5.45	@5.30

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

July	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
24	27¼	65½	65⅝	70½	185½	185½	20¾	20¾
25	27 3/16	66 9/16	66⅝	71½	183½	183¾	20⅞	20¾
26	27¼	....	....	....	....	....	....	....
28	27⅜	67⅜	67¼	72½	184½	184½	21	20¾
29	27½	65¾	65¾	71⅜	185½	185½	21¼	20¾
30	27⅜	66	66	71½	180	180	21	20⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

5.45c. The largest consumer figured as a buyer during the week. Transactions in the aggregate were fairly large. The bulk of the business was placed between 5⅛@5¼c., St. Louis basis.

The London market is firm, good ordinaries being quoted £20 12s. 6d.; specials £20 17s. 6d. per ton.

Other Metals

Aluminum—Business is much quieter again and sales have been rather light. Prices are lower, No. 1 ingots being quoted at 23@23½c. per lb., New York. Foreign metal is quoted at 19@19½c. in bond.

The current price of ingots in London has dropped about £3 and is now £85@88 per ton, which is equal to 18.47@19.12c. per pound.

Antimony—The market has shown some improvement and business has been more active. Prices remain about the same, Cookson's being quoted at 8.40@8.50c. per lb., and Hallett's at 8@8.10c.; while 7.40@7.50c. is quoted for Chinese, Hungarian and other outside brands.

Quicksilver—Business has been quiet and prices are just a shade off. New York quotations are $39@40 per flask of 75 lb. San Francisco, $39.50 for domestic orders and $37 for export. London is 5s. lower, at £7 5s. per flask, with £7 quoted from second hands.

Exports and Imports of Metals, other than iron and steel, in the United States, five months ended May 31, are reported as follows:

	Exports		Imports	
Metals:	1912	1913	1912	1913
Copper, long tons	155,179	181,336	76,021	77,696
Tin, long tons	145	360	23,673	21,286
Lead, short tons	32,620	22,774	42,282	34,819
Zinc, short tons	5,486	5,505	1,565	383
Zinc in ore, lb.	10,632,864	9,138,449	13,763,334	16,341,271
Nickel, lb.	10,895,139	12,440,566	16,814,372	19,567,370
Antimony, lb.	40,320	32,205	6,850,135	9,672,206
Aluminum, lb.	9,656	27,725	10,149,082	12,974,918
Quicksilver, lb.	10,299	29,698	.....	.....
Platinum, oz.	.....	629	42,870	54,838
Ores, etc.				
Zinc oxide, lb.	15,649,983	12,529,349	.....	.....
Zinc dross, lb.	364,695	56,786	.....	.....
Zinc dust, lb.	.....	76,097	.....	1,520,479
Zinc ores, tons	10,702	7,276	20,063	16,815

Copper, lead, nickel and antimony included the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately last year. The exports include reëxports of foreign material.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There is still some demand for Paris and Berlin, but not enough to induce payment of any premium.

Imports of gold at New York for the week were $321,410, chiefly from Mexico and the West Indies. Exports were $410,358, mostly to Holland. In addition to these imports by water $500,000 were received from Canada.

Iridium—Supplies are not increasing and demand remains steady. Dealers still ask about $85 per oz. for pure metal.

Platinum—There is again some talk of higher prices in the near future, but there has been no actual change so far. The dealers here ask $45@46 per oz. for refined platinum, and $49@52 per oz. for hard metal, according to iridium content.

Our Russian correspondent writes under date of July 18 that business has been rather small at St. Petersburg. The stock of platinum is increasing but is still not large and is firmly held. At Ekaterinburg the offers of metal by the staratell are increasing, and are promptly taken up by the speculators. Work at the mines is active and there is some complaint of scarcity of labor. Quotations are unchanged; at Ekaterinburg they are 9.75 rubles per zolotnik—$36.66 per oz.—for crude metal 83% platinum; at St. Petersburg 37,700 rubles per pood—$36.95 per oz.—for the same grade.

It is probable that the proposed law prohibiting the export of crude platinum from Russia will be abandoned altogether, since it is held that it is contrary to some of the provisions of commercial treaties with other powers. It is now proposed, to force the refining of platinum in Russia by levying a tax of 30% on crude metal exported.

Silver—There has been more steadiness with advancing tendency in the silver market the past week, due chiefly to a demand from China, though the Indian Bazaars have also given some support. The political disturbances in China have also helped the firmer tone of silver. Monsoon reports from India continue favorable.

Exports of silver from London to the East, Jan. 1 to July 17, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£3,858,200	£4,045,000	I. £186,800
China	933,500	427,000	D. 506,500
Total	£4,791,700	£4,472,000	D. £319,700

Imports of silver at New York for the week were $259,498, mainly from Central and South America. Exports were $925,792, nearly all to London and Paris.

Zinc and Lead Ore Markets

JOPLIN, MO.—July 26

The high price of zinc blende is $47, the base per ton of 60% zinc ranging from $42.50 to $44. Calamine sold on a base of $21@23 per ton of 40% zinc. Buying was active on a general reduction amounting to almost $2 per ton. The average of all grades is $40.68 per ton. Lead is higher $1, the base is $53.50 for 80% grades and the average of all grades $52.36 per ton.

SHIPMENTS WEEK ENDED JULY 26

	Blende	Calamine	Lead ore	Value
Totals this week ..	10,017,420	846,700	1,408,500	$257,847
Seven months	322,901,510	23,061,240	53,323,000	$8,928,699

Blende value, the week, $210,906; 7 months, $7,232,880.
Calamine value, the week, $10,064; 7 months, $296,801.
Lead value, the week, $36,877; 7 months, $1,400,018.

PLATTEVILLE, WIS.—July 26

The base price paid this week for 60% zinc ore was $43@44 per ton. The base price paid for 80% lead ore was $52 per ton.

SHIPMENTS WEEK ENDED JULY 26

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,703,660	52,400	1,036,600
Year to date.....	83,172,530	4,051,790	35,487,060

Shipped during week to separating plants 2,122,300 lb. zinc ore.

IRON TRADE REVIEW

New York—July 30

There seems to be some improvement in the tone of the iron market. There is a general impression that a new buying movement is coming and that lapse of the present contracts will not be followed by decreased activity at the mills.

There has been an increase in new orders for finished steel, notably in structural material and bars. In smaller building material also an improvement is noted.

Pig iron seems to have reached the turning point and a better feeling is noted, with slight gains in price. Eastern territory is taking a good deal of foundry iron, though mainly in small lots. There is also a better demand for basic pig, and inquiries are frequent.

The United States Steel Corporation report for the quarter ended June 30 gives the net earnings, after paying ordinary repairs and maintenance, as follows:

April	$7,509,207	$13,072,710
May	8,846,821	14,554,566
June	8,746,237	13,592,537
Quarter net	$25,102,265	$41,219,813
Depreciation, etc.		$9,299,202
Interest and sinking funds		5,642,546
Total charges		$14,941,748
Surplus for the quarter		$26,278,065
Dividends		12,658,700
Undivided surplus		$13,619,365

Dividends were 1¾% on preferred and 1¼% on common stock. The net earnings for the quarter were $6,793,012 greater, than for the March quarter, and $16,117,548 more than in the June quarter of 1912. The quarter's earnings were the largest reported since 1907. For the six months ended June 30 the net earnings were $75,646,614, an increase of $32,717,375 over last year.

PITTSBURGH, PENN.—July 29

There has been a slight increase in the volume of new business in most steel products, the buying being almost exclusively for quick shipment, and indeed some mills have to turn down business offered, because shipment in a week or two is frequently required. Production is maintained at

full capacity, but some of the mills are closely approaching the end, having much business on books, for deliveries months ahead, but not enough to maintain full operations unless aided by a fresh buying movement. It would require only a moderate movement to fill the mills up through the winter. No extreme recession is regarded as at all probable.

Pig Iron—The Youngstown Sheet & Tube Co. has bought about 15,000 tons of bessemer at $15.50, Valley, and about 15,000 tons of basic at $14.25, Valley, for August and September. Several other sales of bessemer have been made at the same price. At these slightly reduced prices the market will not unlikely turn upward again. Foundry shows little activity, and large consumers seem now fairly well covered for a time. We quote: Bessemer, $15.50; basic, $14.25; malleable, $14; No. 2 foundry, $13.75; gray forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is quiet as to both prompt and future, with the regular price quoted at $58.50, Baltimore, freight to Pittsburgh being $2.16 per ton.

Steel—The market has been rather quiet, but billets and sheet bars are stiffly held at $26.50 and $27.50, respectively, maker's mill, Pittsburgh or Youngstown. Rods have softened and are quotable at $28@29, Pittsburgh.

IRON ORE

Testimony has been taken in Chicago in the protest filed by certain iron companies against the railroads carrying iron ore to Lake ports. This appeal to the Interstate Commerce Commission is against the additional 5c. loading charge, which has been put on this season, and which is in addition to the freight rate.

Imports and Exports of Iron Ore in the United States five months ended May 31, long tons:

	1912	1913	Changes
Imports	814,264	895,084	I. 80,820
Exports	103,664	121,120	I. 17,454

Imports of manganese ore for the five months were 95,836 tons in 1912, and 183,240 in 1913; increase, 87,404 tons.

COKE

Connellsville coke makers are steadily holding out for $2.50 per ton for furnace coke on contract. They are getting their price too, though many of the contracts are for short time only, few of them running beyond third quarter. Shipments run good and very little coke is being stored.

Coal and Coke Tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie six months ended June 30, short tons:

	1912	1913	Changes
Anthracite	4,572,269	5,418,231	I. 845,962
Bituminous	22,519,781	24,282,419	I.1,762,638
Coke	6,374,293	7,386,908	I.1,012,615
Total	33,466,343	37,087,558	I.3,621,215

The total gain this year was 10.8%; the largest relative increase being in coke.

Exports of Fuel from Great Britain six months ended June 30 were: Coal, 35,526,235; coke, 499,670; briquettes, 1,022,232; coal sent abroad for use of steamships in foreign trade, 10,087,037; total, 47,135,174 long tons. This is an increase of 11,812,563 tons, or 33.4%, over 1912, when the general coal strike limited exports. Imports for the six months were 169,144 tons in 1912, and 13,534 in 1913; a decrease of 155,610 tons.

Fuel Production of German Empire five months ended May 31, in metric tons:

	1912	1913	Changes
Coal mined	70,817,532	77,648,129	I. 6,830,597
Brown coal mined	33,212,644	35,041,459	I. 1,828,815
Coke made	11,439,556	13,333,419	I. 1,893,863
Briquettes made	9,683,358	10,965,057	I. 1,281,699

Of the briquettes reported this year 8,576,457 tons were made from heavy coal or lignite.

CHEMICALS

New York—July 30

The general market is quiet with only an ordinary summer business doing.

Arsenic—The market is quiet. Quotations are $3.12½@3.25 per 100 lb. The imports have been cut down and stocks are not increasing.

Copper Sulphate—Sales have been good. Prices are steady at $5.25 per 100 lb. for carload lots, and $5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is quiet and but little business is forward. Prices are again off a shade, 2,32½c. being asked for spot and futures up to December. It is understood that about two-thirds of the Chilean producers have agreed to a curtailment of output. Another meeting is to be held soon.

PETROLEUM

Rumanian oil production in May was 160,000 metric tons, an increase of 3000 tons over April. The Baku oilfield in Russia produced during March, 31,413,196 poods—511,848 metric tons—of oil, a decrease of 300,830 poods from last year.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	March	April	May	June	July
Alaska shipments	472,293	1,730,252	1,771,508	2,203,191	.....
Anaconda	22,900,000	23,800,000	25,600,000	.....	.....
Arizona, Ltd.	3,200,000	3,100,000	3,200,000	3,000,000	.....
Copper Queen	7,558,709	8,210,166	8,301,605	7,477,936	.....
Calumet & Ariz.	4,250,000	4,500,000	4,300,000	.....	.....
Chino	4,464,723	3,925,409	3,883,611	3,682,706	.....
Detroit	1,640,671	1,856,517	2,001,633	1,750,601	.....
East Butte	1,400,000	1,400,000	1,268,595	.....	.....
Mammoth	1,641,091	1,450,000	1,700,000	1,750,000	.....
Giroux*	625,000	600,000	625,000	.....	.....
Mason Valley	1,608,492	1,264,304	1,186,560	1,097,014	.....
Miami	.....	.....	1,943,900	2,612,000	.....
Nevada Con.	5,555,320	5,650,000	5,933,275	6,344,863	.....
Ohio	591,651	690,001	650,071	.....	.....
Old Dominion	2,853,000	3,040,000	2,749,000	2,511,000	.....
Ray	4,287,000	4,379,128	4,384,400	.....	.....
Shannon	1,260,000	1,238,000	1,080,000	924,000	.....
Sonth, Utah	62,224	132,267	200,000	.....	.....
Tennessee	1,796,394	1,718,188	§1,037,115	1,379,220	.....
United Verde*	3,000,000	3,000,000	3,000,000	.....	.....
Utah Copper Co.	8,248,880	9,539,847	10,003,227	11,637,949	.....
Lake Superior*	19,000,000	17,000,000	18,705,000	16,500,000	.....
Non-rep. mines*	6,203,606	6,000,000	6,300,000	.....	.....
Total prod.	102,619,054	104,224,079	109,824,500	.....	.....
Imports, bars, etc.	24,215,480	25,578,297	22,205,942	.....	.....
Total blister.	126,834,534	129,802,376	132,039,442	.....	.....
Imp. ore & matte	11,911,041	7,177,363	10,528,562	.....	.....
Total Amer.	138,745,575	136,989,739	142,559,004	.....	.....
Miami†	3,102,200	2,312,900	.....	.....	.....
Shattuck-Arizona	1,234,450	1,158,326	1,026,170	1,059,625	.....
Brit. Col. Cos:					
British Col. Cop.	844,735	794,000	.....	.....	.....
Granby	1,967,962	1,857,452	1,782,570	1,789,000	.....
Mexican Cos.:					
Boleo†	2,204,720	2,811,200	2,424,800	1,984,640	.....
Cananea	4,772,000	3,581,690	2,272,000	2,908,000	.....
Moctezuma	3,062,159	2,753,240	2,695,881	3,438,793	.....
Other Foreign:					
Braden, Chile	1,472,000	1,512,000	1,150,000	1,804,000	.....
Cape Cop., S. Af.	732,480	586,880	387,520	414,400	.....
Kyshtim, Russia	1,478,400	2,544,640	1,490,000	.....	.....
Spassky, Russia	974,400	974,400	721,280	835,520	.....
Exports from Chile	7,840,000	7,616,000	3,584,000	5,824,000	.....
Australia	6,944,000	6,608,000	7,840,000	7,616,000	.....
Arrivals—Europe†	15,585,920	10,545,920	13,661,760	5,277,440	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

	United States			Visible Stocks.¶		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VII, '12	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,452,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	.....	.....	.....	52,904,606	71,904,000	124,808,606
VIII.	.....	.....	.....	.....	.....	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq	Sale	Amt.
Andes, Nev.	July 27	Aug. 19	$0.02
Arlington, Ida.	July 3	Aug. 4	0.002
Atlas Wonder, Nev.	July 14	Aug. 6	0.01
Belcher, Calif.	July 21	Aug. 14	0.10
Blue Bell, Ida.	July 15	Aug. 20	0.002
Blue Bull, Nev.	July 14	Aug. 18	0.02
Carbonate, Ida.	July 25	Aug. 25	0.001
Challenge Con., Calif.	July 15	Aug. 5	0.05
Comstock, Ida.	July 24	Aug. 23	0.001
Eagle Mountain, Ida.	July 19	Aug. 16	0.0005
Emerald, Utah (1st install.)	....	Aug. 9	0.005
Galena King, Utah	July 21	Aug. 11	0.02
Gould & Curry	July 14	Aug. 5	0.03
Iron Mask, Ida.	July 11	Aug. 11	0.002
Morning Star, Utah	Aug. 8	Sept. 1	0.0025
North Bunker Hill, Ida.	July 15	Aug. 16	0.002
O.K., Utah	July 26	Aug. 12	0.005
Overman, Calif.	July 24	Aug. 13	0.05
Rescue Eula, Nev.	July 6	Aug. 11	0.01
Saltese, Ida.	July 20	Aug. 20	0.002
Savage, Nev.	July 14	Aug. 5	0.05
Temple, Ida.	July 19	Aug. 23	0.002
Tintic & Central, Utah	.....	Aug. 9	0.005
Tintic Delmar, Utah	July 16	Aug. 16	0.0015
Tuscumbia, Ida.	Aug. 1	Aug. 23	0.003
Umatilla, Nev.	July 14	Aug. 18	0.01
Utah-United, Utah	July 19	Aug. 11	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.200	58.990	24.486	28.215	27.199
July	52.630	60.654	.....	24.286	27.919	.....
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	.....	17.353	.....	76.636	.....
August	17.498	.....	17.644	.....	78.670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	.....	202.446	.....
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	.....	4.603	.....	18.544	.....
August	4.569	.....	4.452	.....	19.655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	.....	6.966	.....	26.174	.....
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.25	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	.....	14.38	.....	14.38	.....
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS July 29

Name of Comp.	Bid.
Acacia	.02⅜
Cripple Cr'k Con.	.01⅜
C. K. & N.	.10
Doctor Jack Pot	.05⅜
Elkton Con.	.54
El Paso	2.70
Findlay	.02½
Gold Dollar	.07⅜
Gold Sovereign	.02⅜
Isabella	.11
Jack Pot	.04½
Jennie Sample	.05¾
Lexington	‡.01
Moon Anchor	‡.007
Old Gold	.01½
Mary McKinney	.52
Pharmacist	.01
Portland	.95¾
Vindicator	.84
Work	.005

SALT LAKE July 29

Name of Comp.	Bid.
Beck Tunnel	.05
Black Jack	.05
Cedar Talisman	.00½
Colorado Mining	.14
Columbus Con.	.01
Crown Point	.06
Daly-Judge	6.30
Grand Central	.50
Iron Blossom	1.22½
Little Bell	‡.10
Lower Mammoth	.01
Mason Valley	6.50
May Day	.06
Nevada Hills	.91
New York	.02
Prince Con	.30
Silver King Coal'n	3.15
Sioux Con.	.01
Uncle Sam	.02½
Yankee	.08

TORONTO July 28

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.08	Foley O'Brien	.22
Coniagas	7.35	Hollinger	15.75
T. & Hudson Bay	68.00	Imperial	.01
Timiskaming	.30	Jupiter	.34
Wettlaufer-Lor	.11	Pearl Lake	.34
Apex	.01	Porcu. Gold	.09
Crown Chartered	.00½	Preston E. D.	.02
Dobie	.25	Rea	.15
Dome	15.00	Swastika	.04
Dome Exten	.07	West Dome	.15

SAN FRANCISCO July 29

Name of Comp.	Bid	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.00
Belcher	.24	Jim Butler	.70
Best & Belcher	.06	MacNamara	.15
Caledonia	1.40	Midway	.47
Challenge Con	.05	Mont.-Tonopah	1.05
Chollar	.01	North Star	.96
Confidence	.18	West End Con	1.25
Con. Virginia	.12	Atlanta	.16
Crown Point	.26	Booth	.01
Gould & Curry	.04	C.O.D. Con	.03
Hale & Norcross	.08	Comb. Frac	.03
Mexican	1.12½	Jumbo Extension	.12
Occidental	.70	Pitts.-Silver Peak	‡.45
Ophir	.23	Round Mountain	.57
Overman	‡.50	Silver Pick	.03
Potosi	.01	Tramp Con	‡.01
Savage	.12	Argonaut	2.00
Sierra Nevada	.09	Bunker Hill	1.50
Union Con	.12	Central Eureka	.10
Yellow Jacket	.21	So. Eureka	2.25

N. Y. EXCH. July 29

Name of Comp.	Clg.
Amalgamated	70⅛
Am. Agri. Chem	47
Am.Sm.&Ref.,com	63⅝
Am. Sm. & Ref., pf.	100¼
Am. Sm. Sec., pf. B	80¼
Anaconda	35⅞
Batopilas Min.	1¼
BethlehemSteelpf	73½
Chino	38
Federal M. & S., pf.	33⅛
GreatNor.,ore,,ctf.	36½
Guggen. Exp.	44⅜
Homestake	103
Inspiration Con.	15¼
Miami Copper	23⅛
Nat'nalLead,com.	49⅜
National Lead, pf.	106½
Nev. Consol.	16¼
Phelps Dodge	190
Pittsburg Coal, pf.	82½
Quicksilver, pf.	4½
Ray Con	19
RepublicI&S,com.	24
Republic I & S, pf.	85⅜
SlossSheffi'd,com.	26
Sloss Sheffield, pf.	85
Tennessee Copper	30⅞
Utah Copper	48¼
U. S. Steel, com	58⅜
U. S. Steel, pf.	108¼
Va.Car. Chem., pf.	99⅞

N. Y. CURB July 29

Name of Comp.	Clg.
Barnes King	‡1.45
Beaver Con.	.32
Big Four	.41
Braden Copper	6⅝
B. C. Copper	2⅛
Buffalo Mines	2½
Can. G. & S.	.25
Con. Ariz. Sm.	5/16
Davis-Daly	2 1/16
Diam'field-Daisy	.02
Ely Con.	.09
Florence	.34
Giroux	1½
Gold Hill Con.	‡⅛
Goldfield Con.	1¾
Greene Cananea	6¼
Greenwater	.06
Internat. S. & R.	‡169
Kerr Lake	3 5/16
Keystone	‡2
La Rose	2 5/16
McKinley-Dar-Sa.	1 1/16
Min. Co. of A. new	2⅜
Motherlode Gold.	‡.60
Nipissing Mines	8½
Ohio Copper	⅛
Pacific Sm. & M.	1/16
Puebla S. & R.	2⅛
South Live Oak	‡2
South Utah M. & S.	¼
Stand'd Oil of N.J.	366
Stewart	1¾
Tonopah	4⅜
Tonopah Ex.	2¼
Tonopah Merger	.76
Tri-Bullion	1/16
Tularosa	⅛
Union Mines	1/16
United Cop., pfd.	3
Yukon Gold	2½

LONDON July 19

Name of Com.	Clg.
Camp Bird	£0 15s 0d
El Oro	0 14 3
Esperanza	1 1 10½
Mexico Mines	5 5 0
Oroville	0 5 3
Santa Gert'dis	1 0 0
Stratton's	0 1 7½
Tomboy	1 5 0

BOSTON EXCH. July 29

Name of Comp.	Clg.
Adventure	1
Ahmeek	275
AlaskaGold M.	18⅞
Algomah	1¼
Allouez	32
Am. Zinc	19¾
Ariz. Com., ctfs.	2¼
Bonanza	.32
Boston & Corbin	.80
Butte & Balak	1½
Calumet & Ariz	64½
Calumet & Hecla	405
Centennial	11½
Cliff	1½
Copper Range	38⅛
Daly West	21⅛
East Butte	12⅛
Franklin	5
Granby	59¾
Hancock	16¾
Hedley Gold	‡30
Helvetia	.25
Indiana	5¼
Island Cr'k, com.	47½
Island Cr'k, pfd.	81
Isle Royale	20
Keweenaw	1⅞
Lake	6½
La Salle	4
Mass	3
Michigan	1
Mohawk	42¼
New Arcadian	1⅜
New Idria Quick	‡3⅝
North Butte	27⅝
North Lake	1½
Ojibway	.70
Old Dominion	48
Osceola	76½
Quincy	56
Shannon	7⅝
Shattuck-Ariz	25¼
Superior	24⅞
Superior & Bost.	2¾
Tamarack	27
Trinity	4
Tuolumne	.80
U. S. Smelting	37¾
U. S. Smelt'g, pf.	47½
Utah Apex	1¾
Utah Con	9¼
Victoria	.93
Winona	1
Wolverine	44
Wyandot	.60

BOSTON CURB July 29

Name of Comp.	Bid
Bingham Mines	3
Boston Ely	.48
Boswyocolo	‡.01
Butte Central	.10
Cactus	.04
Calaveras	2⅝
Chief Cons	1 3/16
Corbin	1⅛
Cortez	.25
Crown Reserve	3½
Eagle & Blue Bell	.95
First Nat. Cop.	2⅝
Houghton Copper	3½
Majestic	.34
Mexican Metals	.50
Moneta Porc	‡.07
Nevada-Douglas	1⅜
New Baltic	.75
Oneco	.75
Raven Copper	.15
Rhode Island Coal	.02
Smokey Dev.	‡.75
S. W. Miami	‡1½
South Lake	‡4
Trethewey	.33
United Verde Ext.	.63

‡Last quotation.